SOIL SURVEY OF

Erath County, Texas

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Texas Agricultural Experiment Station

Issued January 1973

Major fieldwork for this soil survey was done in the period 1960–65. Soil names and descriptions were approved in 1966. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1966. This survey was made cooperatively by the Soil Conservation Service and the Texas Agricultural Experiment Station. It is part of the technical assistance furnished to the Bosque, Palo Pinto, and Upper Leon Soil and Water Conservation Districts.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for agriculture, industry, and recreation.

Locating Soils

All the soils of Erath County are shown on the detailed soil map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with a number shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all the soils of the county in alphabetic order by map symbol. It shows the page where each soil is described, and also the page for the capability unit and range site.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and range sites.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Use of Soils for Wildlife."

Ranchers and others can find, under "Use of Soils for Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Engineers and builders can find, under "Use of Soils for Engineering," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers to Erath County may wish to refer to the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication.

Cover picture: Peanuts on Nimrod fine sand.

U.S. GOVERNMENT PRINTING OFFICE: 1973

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Contents

SOIL SURVEY OF ERATH COUNTY, TEXAS

BY BILLY J. WAGNER, JESSE R. THOMAS, EDWARD R. HARRIS, ERNESTO DELEON, CECIL G. FORD, AND J. DAVID KELLEY
SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE TEXAS AGRICULTURAL EXPERIMENT STATION

ERATH COUNTY is in the central part of Texas (fig. 1). It has a total area of about 694,400 acres, or 1,085 square miles. Stephenville, the county seat, has a population of about 9,000 and serves a productive livestock and farming area.

Approximately 23 percent of the county is cropland. This figure includes some idle cropland. Much of the cropland is subject to soil blowing and water erosion. Oats are grown on more acres annually than any other crop. The oats are grazed by livestock, however, and only a small part is harvested for grain. Peanuts, grain sorghum, and cotton are the major cash crops. Orchards, truck crops, and nursery crops are also of importance. About 74 percent of the county is used as grazing lands for cattle, sheep, and goats. Dairying and beef cattle are major sources of farm income. Poultry products, mohair, and wool sales are also important to the economy of Erath County. Fishing, wildlife, and recreation, as forms of economic land use, contribute to the income of the county.

Erath County is dissected by many small streams and rivers. All of these drainageways head within the county,

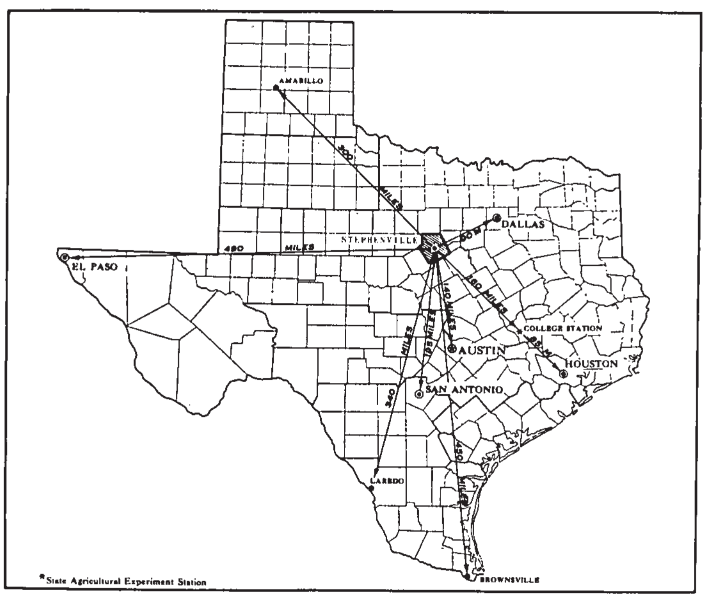


***Figure 1.*—Location of Erath County in Texas.**

and no significant amounts of water flow into the county. Elevation ranges from 900 to 1,750 feet. The county is divided into three major physiographic areas, the Grand Prairie, the West Cross Timbers, and the North Central Prairie. The soils of these three major areas are discussed in the section "General Soil Map."

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Erath County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. They observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many characteristics of the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey (*7*).[1]

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Nimrod and Windthorst, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of their surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such

[1] Italic numbers in parentheses refer to Literature Cited, page 80.

differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Windthorst fine sandy loam, 1 to 3 percent slopes, is one of several phases within the Windthorst series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Erath County: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Brackett-Purves complex is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Thurber and Waurika soils is an example.

In most areas surveyed, there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Gullied land is a land type in Erath County.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils suitable for cultivation.

The soil scientists set up trial groups of soils on the basis of yield and practice tables and other data they have collected. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Erath County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is a useful general guide in managing a watershed, an area of rangeland, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in Erath County are discussed in the following pages.

1. Windthorst-Duffau association

Moderately deep and deep, gently sloping to sloping, sandy and loamy soils that have reddish, loamy and clayey layers in the lower part

This soil association occupies convex hills and ridges that form long timbered bands one-half to 4 miles wide. It makes up about 24 percent of the county. About 75 percent of this association consists of Windthorst soils, and 20 percent is Duffau soils. Minor areas of the May, Bunyan, Gowen, Selden, Nimrod, and Waurika soils and of Gullied land make up the remaining 5 percent.

The Windthorst soils have a fine sandy loam to loamy very fine sand surface layer that rests abruptly on reddish-brown, acid sandy clay lower layers. Very pale brown fine sand is at a depth of about 42 inches.

The primarily gently sloping Duffau soils are deep and have a sandy clay loam to loamy fine sand surface layer that grades to yellowish red in the lower layers.

This association was extensively cultivated in the past, but many old fields are now in native grass. Cultivated areas are planted mainly in sorghums, small grains, and peanuts. Some fields have been sodded to bermudagrass.

2. Nimrod-Selden association

Deep, nearly level to sloping, sandy soils that have mottled, loamy layers in the lower part

This association consists of sandy soils that have mixed concave and convex surfaces. It makes up about 5 percent of the county. Nimrod soils occupy about 35 percent of the association, Selden soils 22 percent, and Windthorst soils 18 percent. These soils occur in mixed, irregular patterns. About 25 percent of this association consists of the less extensive Patilo, Arenosa, Duffau, Bunyan, and

Waurika soils. In areas of active soil blowing, sand accumulations are common in fence rows.

The Nimrod soils have a fine sand surface layer 20 to 40 inches thick that grades to very firm, mottled sandy clay loam lower layers (fig. 2).

The Selden soils have a fine sand surface layer less than 20 inches thick that is underlain by layers of mottled, firm sandy clay loam.

The Windthorst soils have a surface layer that ranges from fine sandy loam to loamy very fine sand. This layer overlies layers of reddish-brown, acid sandy clay.

Many areas of this association are used for growing peanuts, sorghums, and watermelons. Some old fields have been sodded to bermudagrass pasture. Scrub post oak and blackjack oak are the principal trees in wooded areas. The soils of this association are susceptible to soil blowing and water erosion.

3. *Chaney-Demona association*

Deep, nearly level to sloping, sandy soils that have mottled, clayey layers in the lower part

This soil association consists of sandy timbered areas that have a mixed concave and convex surface. The association makes up about 3 percent of the county. Chaney soils occupy about 33 percent of the association, Demona soils 12 percent, and Windthorst soils 10 percent. These soils occur in mixed irregular patterns. Lesser areas of the Patilo, Arenosa, Nimrod, Bunyan, and Bonti soils make up the remaining 45 percent of the association.

The Chaney soils typically have a loamy sand surface layer less than 20 inches thick underlain by mottled, very firm sandy clay lower layers. The Demona soils have a loamy sand surface layer 20 to 40 inches thick and mottled, very firm sandy clay lower layers. The Windthorst soils have a surface layer that ranges from fine sandy loam to loamy very fine sand. Below this layer are reddish-brown, acid sandy clays.

Much of this association is in native post oak and blackjack oak woods. Some areas are cultivated; peanuts, small grain, and sorghums are the principal crops. A few areas have been sodded to bermudagrass for pasture. The soils of this association are susceptible to soil blowing and water erosion.

4. *Houston Black-Denton-Purves association*

Nearly level to gently sloping, clayey soils that are deep to shallow over limestone and marl

This association occupies concave valleys and gently sloping prairies and covers about 8 percent of the county. Houston Black and Denton soils make up about 50 percent of the association, and the Purves soils 25 percent. These soils developed over interbedded limestone and marl (fig. 3). Minor areas of Maloterre, Bolar, Frio, Bosque, and Dugout soils comprise about 25 percent of the association.

The Houston Black soils have a clay surface layer and firm, very slowly permeable clay lower layers. They crack when dry. The Denton soils have silty clay surface and lower layers that rest on limestone beds at a depth of about 40 inches. The Purves soils are clay underlain by hard limestone at a depth of about 14 inches.

Most of this association is cultivated. Small grains, sorghums, and cotton are the crops commonly grown. Some areas are in native grass.

The soils in this association have low to high available water capacity. If they are cultivated when wet, they compact and run together, which reduces aeration, permeability, and tilth. Water erosion is a problem in some places.

5. *Maloterre-Purves-Dugout association*

Stony and gravelly soils that are shallow to very shallow over limestone

This soil association occupies convex gently rolling prairies, steep limestone ridges, and slopes that have a benched or stairstep appearance. It makes up about 46 percent of the county.

Maloterre and Purves soils comprise about 45 percent of the association, and Dugout soils 15 percent. The acreage of Maloterre soils is slightly larger than that of the Purves soils. These soils occur in a narrow, banded, complex pattern. Narrow bands of Somervell, Altoga, Brackett, Hensley, Lewisville, and Frio soils make up the remaining 40 percent of this association.

The Maloterre soils have a very thin clay loam surface layer that rests abruptly on hard limestone bedrock. The Purves soils have a clay surface layer over hard limestone at about 14 inches. Dugout soils have a gravelly clay loam surface layer and clay loam lower layers that are underlain by hard limestone at a depth of about 18 inches.

This association is dominantly an open prairie marked by a few scattered live-oak motts. Juniper and mesquite trees grow in some areas. The soils of this association are too shallow and stony for cultivation. They are best suited to native range. Little bluestem, silver bluestem, side-oats grama, tall grama, and buffalograss are the common native grasses.

6. *Truce-Bonti-Owens association*

Stony soils that are dominantly moderately deep to shallow over shale and sandstone

This gently sloping to steep soil association is made up of loamy to clayey stony soils. It is a timbered area of sandstone hills, ridges, and shaly slopes. This association occupies about 8 percent of the county.

Truce soils comprise about 40 percent of the association, and Bonti and Owens soils 20 percent. The acreage of Bonti soils is slightly larger than that of the Owens soils. Minor areas of Exray, Vashti, Thurber, Chaney, Waurika, May, Venus, Bosque, and Bunyan soils make up about 40 percent of the association. Most areas of this association have sandstone fragments on the surface and throughout the soil profile.

Truce soils are on ridgetops and steep stony hillsides. They have a brown fine sandy loam surface layer and very firm, reddish-brown to brown clay lower layers that grade to alkaline shale at a depth of about 40 inches.

Bonti soils are on ridgetops. They have a brown fine sandy loam surface layer and firm red lower layers that rest on sandstone at a depth of 30 inches.

Owens soils lie mainly on steep south-facing slopes that are shaly and eroded. They consist of light olive-brown

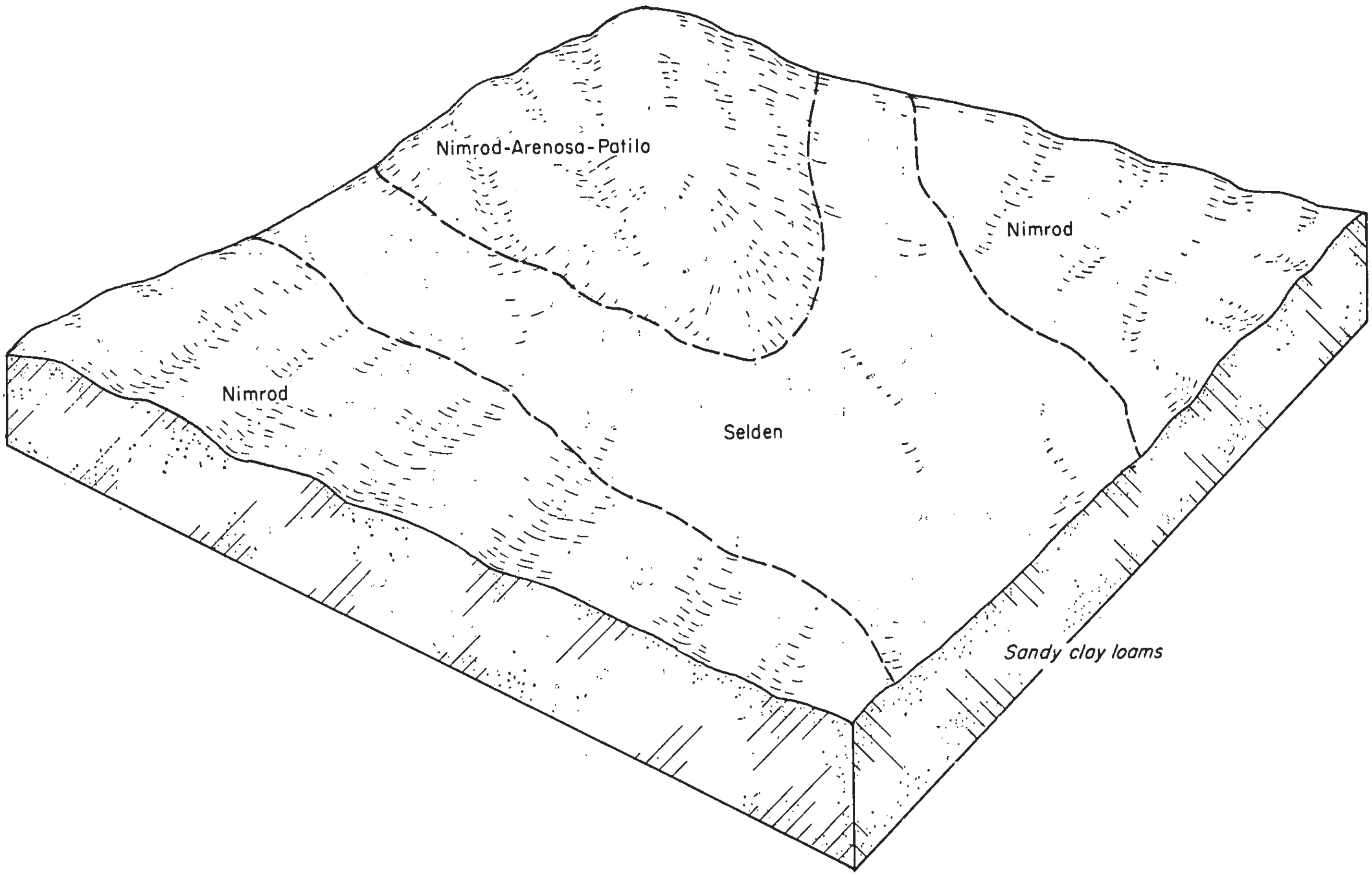


***Figure 2.*—Representative pattern of soils in the Nimrod-Selden association.**

calcareous clays that grade to olive shale at a depth of 16 inches.

Most of this association is too steep and stony for cultivation and is best suited to native range. Many areas are in wooded range. The Bonti and Truce parts are mainly covered with post oak. In areas where the timber and brush have been controlled, conditions favor growth of common native grasses, such as little bluestem, big bluestem, side-oats grama, silver bluestem, and indiangrass. The Owens part of the association supports some grasses, such as buffalograss, curly mesquite, and Texas wintergrass. Water erosion is a problem on the steeper slopes.

7. *Frio-Venus-Bosque association*

Deep, nearly level to gently sloping, calcareous, loamy soils on flood plains and stream terraces

This soil association consists of long narrow bands that lie in the flood plains and on terraces of major streams in the county. It covers about 5 percent of the county. Frio and Venus soils make up about 67 percent of the association, and Bosque soils 20 percent. The acreage of Frio soils is slightly larger than that of the Venus soils. Minor areas of the Lewisville, Trinity, and Gowen soils make up 13 percent of the association.

The nearly level Frio soils have a calcareous clay loam surface layer underlain by calcareous clay loam to silty clay lower layers. They occupy flood plains.

The Venus soils have a dark grayish-brown calcareous loam surface layer. They are nearly level to gently sloping and are on benches a few feet above streams.

The Bosque soils have a calcareous loam surface layer and calcareous loam to clay loam or clay lower layers. They are nearly level and are on flood plains.

Most of this association is cultivated. Small grain, sorghums, and cotton are the principal crops. Established pecan orchards are in some areas, and other areas are in bermudagrass pastures. Nearly all of this association is suitable for cultivation.

8. *Duffau-Bunyan association*

Deep, nearly level to gently sloping, loamy soils

This soil association forms a long narrow band along the flood plains and on terraces. It makes up about 1 percent of the county. Duffau soils occupy about 60 percent of this association, and Bunyan soils 30 percent. Minor areas of the Lewisville, Bosque, and Windthorst soils make up 10 percent of the association.

Duffau soils have a surface layer that ranges from sandy clay loam to loamy fine sand and grades to

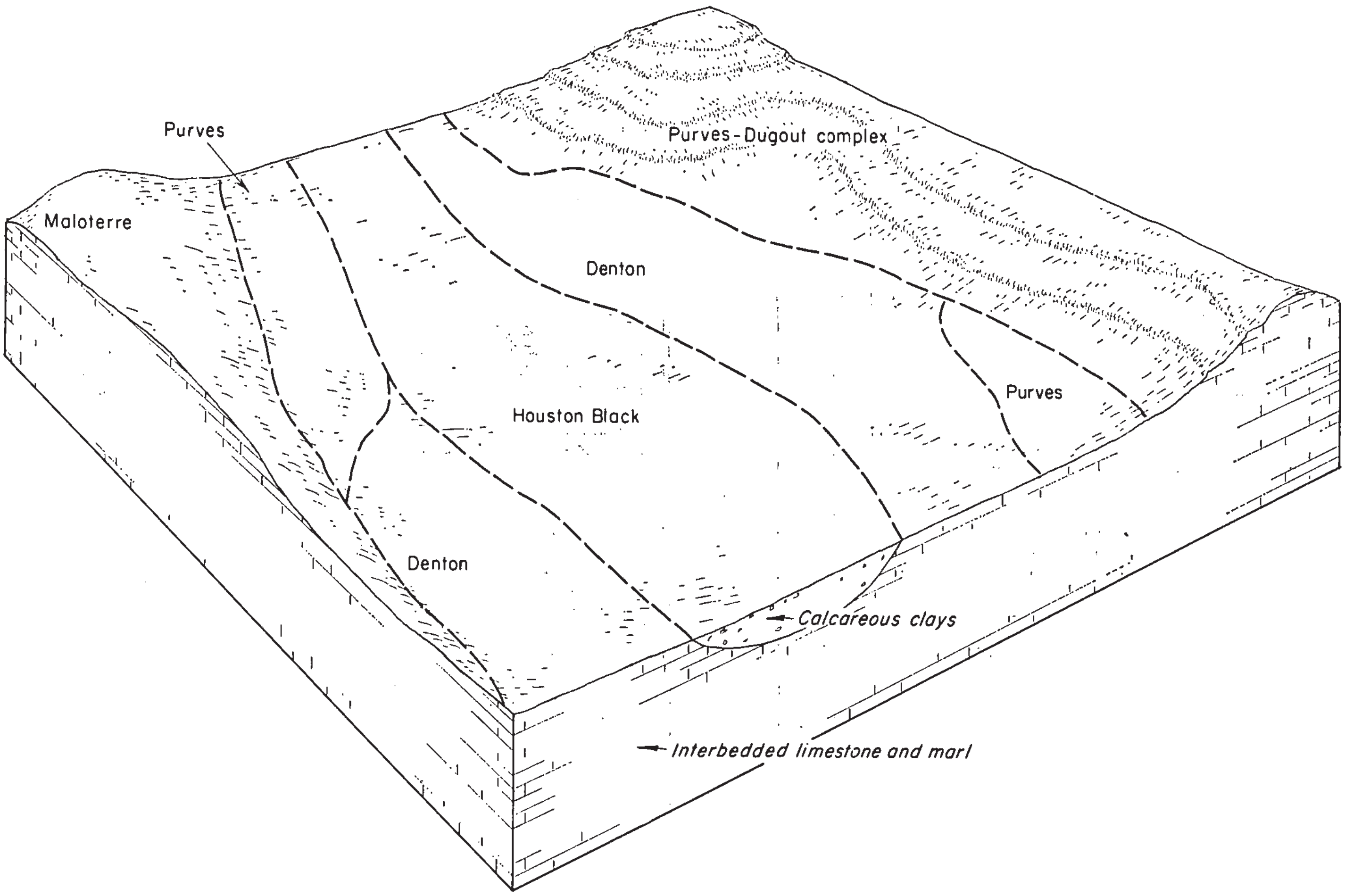


Figure 3.—**Representative pattern of soils in the Houston Black-Denton-Purves association.**

yellowish red sandy clay loam in the lower layers. These soils lie in bands on benches and terraces above the flood plains.

The Bunyan soils have a fine sandy loam surface layer and stratified fine sandy loam, clay loam, and sandy clay loam lower layers. They are in long bands on the flood plains.

Most of this association is cultivated. Peanuts, sorghums, and small grain are the principal crops. A few old fields have been seeded to grass. Some native pecan trees are on the Bunyan soils. Some areas of the Bunyan soils are subject to occasional damaging overflow. Soil blowing and water erosion are problems on sloping areas of the Duffau soils.

Descriptions of the Soils

This section describes each of the soil series and the mapping units in Erath County. The procedure is first to describe each soil series, and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which it belongs.

Each soil series contains two descriptions of a soil profile, or the major layers of the soil from the surface downward. The first is brief and in terms familiar to a layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. This profile is considered typical, or representative, for all the soils of the series. If the profile for a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, unless they are apparent from the name of the mapping unit.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Gullied land and Sandy alluvial land, for example, do not belong to a series but, nevertheless, are listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identified the mapping unit on the detailed soil map at the back of the survey. Listed at the end of each description of a mapping unit are the capability unit and range site in which the mapping

unit has been placed. The page on which each capability unit or range site is described can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the end of this survey.

Soil colors are for dry soil unless colors are specified for moist soil.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Altoga clay loam, 1 to 8 percent slopes, severely eroded	3, 267	0. 5
Altoga-Duffau complex, 3 to 20 percent slopes, eroded	17, 658	2. 5
Altoga-Lewisville clay loams, 5 to 8 percent slopes, eroded	12, 721	1. 8
Blanket clay loam, 0 to 1 percent slopes	1, 402	. 2
Blanket clay loam, 1 to 3 percent slopes	10, 129	1. 5
Blanket clay loam, 1 to 5 percent slopes, severely eroded	140	(1)
Bolar clay loam, 3 to 5 percent slopes, eroded	1, 440	. 2
Bolar-Denton complex, 3 to 5 percent slopes	13, 897	2. 0
Bonti-Exray stony fine sandy loams	9, 551	1. 4
Bosque loam, occasionally flooded	14, 287	2. 1
Brackett-Dugout complex, 8 to 40 percent slopes	25, 948	3. 7
Brackett-Purves complex	23, 100	3. 3
Bunyan fine sandy loam, occasionally flooded	3, 781	. 5
Bunyan soils, frequently flooded	18, 959	2. 7
Chaney loamy sand, 1 to 5 percent slopes	3, 977	. 6
Chaney stony loamy sand	1, 038	. 2
Chaney soils, 1 to 5 percent slopes, eroded	2, 012	. 3
Crawford clay, 1 to 3 percent slopes	321	. 1
Demona loamy sand, 0 to 5 percent slopes	2, 625	. 4
Denton silty clay, 1 to 3 percent slopes	9, 875	1. 4
Duffau fine sandy loam, 0 to 1 percent slopes	534	. 1
Duffau fine sandy loam, 1 to 3 percent slopes	7, 656	1. 1
Duffau fine sandy loam, 3 to 5 percent slopes	5, 380	. 8
Duffau loamy fine sand, 0 to 5 percent slopes	5, 639	. 8
Duffau soils, 2 to 5 percent slopes, eroded	15, 719	2. 3
Duffau soils, 5 to 8 percent slopes	3, 111	. 5
Duffau soils, 2 to 8 percent slopes, severely eroded	3, 672	. 5
Frio clay loam, occasionally flooded	19, 384	2. 8
Gowen clay loam, occasionally flooded	2, 901	. 4
Gullied land	3, 154	. 5
Hensley loam, 1 to 3 percent slopes	956	. 1
Hensley stony loam	4, 104	. 6
Houston Black clay, 0 to 1 percent slopes	887	. 1
Houston Black clay, 1 to 3 percent slopes	17, 161	2. 5
Lamar loam, 1 to 3 percent slopes	2, 273	
Lamar loam, 3 to 5 percent slopes	2, 799	. 4
Lewisville clay loam, 1 to 3 percent slopes	11, 777	1. 7
Lewisville clay loam, 3 to 5 percent slopes	16, 666	2. 4
Lewisville-Altoga clay loams, 3 to 5 percent slopes, eroded	3, 640	. 5
Lindy fine sandy loam, 1 to 3 percent slopes	547	. 1
Lindy fine sandy loam, 1 to 3 percent slopes, eroded	391	. 1
Lindy loam, 1 to 3 percent slopes	1, 251	. 2
Maloterre soils	27, 817	4. 0
May fine sandy loam, 0 to 1 percent slopes	1, 711	. 3
May fine sandy loam, 1 to 3 percent slopes	6, 124	. 9
Mine dumps	52	(1)
Nimrod fine sand, 0 to 5 percent slopes	11, 200	1. 6
Nimrod-Arenosa-Patilo fine sands, 0 to 3 percent slopes	4, 867	. 7
Nimrod-Arenosa-Patilo fine sands, 3 to 8 percent slopes	768	. 1
Owens stony clay, 3 to 20 percent slopes	6, 983	1. 0
Purves clay, 1 to 3 percent slopes	8, 974	1. 3
Purves clay, 3 to 5 percent slopes	13, 048	1. 9
Purves-Dugout complex	110, 059	15. 8
Sandy alluvial land	517	. 1
Selden fine sand, 1 to 5 percent slopes	4, 780	. 7
Selden soils, 1 to 5 percent slopes, eroded	3, 577	. 5
Somervell-Maloterre complex	3, 117	. 4
Thurber and Waurika soils	7, 712	1. 1
Trinity clay, occasionally flooded	485	. 1
Truce fine sandy loam, 1 to 5 percent slopes	5, 890	. 8
Truce stony fine sandy loam, 5 to 40 percent slopes	16, 454	2. 2
Vashti loamy fine sand, 1 to 3 percent slopes	484	. 1
Vashti stony loamy fine sand	646	. 1
Venus loam, 0 to 1 percent slopes, occasionally flooded	4, 385	. 6
Venus loam, 1 to 3 percent slopes	2, 563	. 4
Venus loam, 3 to 5 percent slopes	785	. 1
Waurika fine sandy loam, 0 to 1 percent slopes	916	. 1
Waurika fine sandy loam, 1 to 3 percent slopes	2, 479	. 4
Waurika fine sandy loam, 1 to 3 percent slopes, eroded	1, 090	. 2
Waurika fine sandy loam, thick surface, 0 to 2 percent slopes	4, 226	. 6
Windthorst loamy very fine sand, 1 to 5 percent slopes	16, 147	2. 3
Windthorst fine sandy loam, 1 to 3 percent slopes	16, 610	2. 4
Windthorst fine sandy loam, 1 to 3 percent slopes, eroded	38, 930	5. 6
Windthorst fine sandy loam, 3 to 5 percent slopes	6, 812	1. 0
Windthorst fine sandy loam, 5 to 8 percent slopes	1, 727	. 2
Windthorst soils, 3 to 5 percent slopes, eroded	24, 363	3. 5
Windthorst soils, 1 to 8 percent slopes, severely eroded	32, 372	4. 7
Total	694, 400	100. 0

[1] Less than 0.1 percent.

Altoga Series

The Altoga series consists of deep, calcareous, loamy soils. These gently sloping to moderately steep soils occupy foot slopes below limestone hills.

In a representative profile, the surface layer is light brownish-gray calcareous clay loam about 8 inches thick. Below the surface layer, to a depth of 40 inches, is pale-brown to light yellowish-brown, granular, calcareous clay loam. The underlying material is very pale brown clay loam that contains many calcium carbonate concretions.

Most areas of the Altoga soils are used for native grass pasture. Little bluestem, side-oats grama, and windmill-grass are common. Altoga soils are well drained, have moderate permeability, and have a high available water capacity.

Representative profile of Altoga clay loam, in an area of Altoga-Duffau complex, in a pasture 200 yards north of Farm Road 1189, which is 2 miles north-northeast of the junction of Farm Road 1189 and Farm Road 1188. This junction is about 3 miles east of Morgan Mill, Tex., on Farm Road 1189.

A1—0 to 8 inches, light brownish-gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) when moist; moderate, fine, granular structure; hard when dry, friable when moist; many worm casts; few fine calcium carbonate concretions and fragments; calcareous; moderately alkaline; clear, smooth boundary.

B21—8 to 20 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 5/3) when moist; moderate, fine, granular structure; hard when dry, friable when moist; common calcium carbonate concretions; calcareous; moderately alkaline; gradual, wavy boundary.

B22—20 to 40 inches, light yellowish-brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) when moist; moderate, fine, granular structure; hard when dry, friable when moist; calcareous; moderately alkaline; common calcium carbonate concretions and fragments; gradual, wavy boundary.

C—40 to 60 inches, very pale brown (10YR 7/4) clay loam, light yellowish brown (10YR 6/4) when moist; 30 to 40 percent, by volume, calcium carbonate concretions; calcareous; moderately alkaline.

The A horizon ranges from 6 to 15 inches in thickness but commonly is about 8 inches thick. It ranges from grayish brown to very pale brown, in hue 10YR, value 5 to 7 when dry or 3.5 to 5 when moist, and chroma 2 to 4.

The B2 horizon ranges from 16 to 36 inches in thickness and from clay loam to silty clay in texture. Clay content ranges from 35 to 50 percent. Color is light brownish gray to very pale brown in hue 10YR, value 6 or 7, and chroma 2 to 4. Calcium carbonate concretions range from few to many, and total carbonate content is 40 to 60 percent.

The C horizon is very pale brown to yellow and contains many calcium carbonate concretions and fragments.

Altoga clay loam, 1 to 8 percent slopes, severely eroded (AaD3).—This gently sloping to sloping soil is at the foot of steep limestone hills. Most areas are dissected by gullies or drainageways 10 to 15 feet deep and 15 to 20 feet across. Branching from these gullies are smaller ones 3 to 6 feet deep and 20 to 50 feet apart. Erosion ranges from slight between the gullies to severe in the vicinity of the gullies.

The surface layer is light brownish-gray calcareous clay loam about 6 inches thick. Below the surface layer is pale-brown to very pale brown, granular, calcareous clay loam. Below a depth of 36 inches is very pale brown calcareous clay loam.

Included in mapped areas of this soil are small areas of Lamar loam and Lewisville clay loam.

This Altoga clay loam, 1 to 8 percent slopes, is in range. (Capability unit VIe-1; Deep Upland range site)

Altoga-Duffau complex, 3 to 20 percent slopes, eroded (AdE2).—This mapping unit consists of loamy, broken, eroded soils. It forms a gently sloping to moderately steep, long, narrow band just below limestone escarpments. It is dissected by a few deep gullies.

This mapping unit is 40 percent Altoga clay loam, 30 percent Lewisville clay loam, 15 percent Duffau and Windthorst soils, and 15 percent small areas of Bolar, Purves, and other soils.

The Altoga soil in this unit has the profile described as representative for the Altoga series.

The Lewisville soils have a surface layer of a dark grayish-brown calcareous clay loam about 12 inches thick. Below the surface layer is grayish-brown calcareous clay loam. Below a depth of 40 inches is pale-brown calcareous clay loam.

The Duffau and Windthorst soils have a surface layer of pale-brown fine sandy loam about 5 inches thick. The next layers are reddish-brown to yellowish-red, neutral to medium acid sandy clay to sandy clay loam. The underlying layers, below 40 inches, are neutral to slightly acid sandy clay loam and fine sand.

This mapping unit is in native range. It is too steep, broken, and eroded for cultivation. (Capability unit VIe-1; Deep Upland range site)

Altoga-Lewisville clay loams, 5 to 8 percent slopes, eroded (AlD2).—This mapping unit consists of eroded foot slopes below steep limestone hills. The soils are in mixed irregular patterns. Erosion ranges from slight to severe. Some areas contain limestone fragments and rocks that have washed from stony soils above. About 60 percent of this mapping unit is Altoga clay loam, 30 percent is Lewisville clay loam, and 10 percent is small areas of other soils.

The Altoga soil has a light brownish-gray calcareous clay loam surface layer about 6 inches thick. Below the surface layer is a pale-brown, granular, calcareous clay loam. Very pale brown calcareous clay loam is below a depth of 40 inches.

The Lewisville soil has a dark grayish-brown calcareous clay loam surface layer about 11 inches thick. Below the surface layer is a grayish-brown, granular, calcareous clay loam. At a depth below 40 inches is pale-brown calcareous clay loam.

Included in mapped areas of this unit are small areas of Lamar and Venus soils.

Most of this mapping unit is in range. Little bluestem is the dominant range grass. Some old fields have been reseeded to native grasses; other old fields are reseeding naturally. The soils of this unit are best suited to grass, but small grain and sorghums are grown on some of the acreage. Runoff is slow to medium, and erosion is a hazard when the soils are cultivated. (Capability unit IVe-1; Deep Upland range site)

Arenosa Series

The Arenosa series consists of deep, neutral to acid, loose sands. These soils developed in a thick mantle of

450-374—72——2

loose sand. They occupy undulating uplands that have dominant slopes of 1 to 5 percent. In Erath County, Arenosa soils are mapped only as a component of the Nimrod-Arenosa-Patilo fine sands mapping units.

In a representative profile, the surface layer is a light brownish-gray, neutral, loose fine sand about 4 inches thick. Below the surface layer, to a depth of more than 60 inches, is a very pale brown to pink, slightly acid to medium acid, loose fine sand.

Most areas of Arenosa soils are in brushy rangeland and pasture. A few areas are cultivated. Peanuts and watermelons are the principal crops grown. These soils are well drained, have very rapid permeability, and have a low available water capacity. Soil blowing is a hazard in cultivated areas.

Representative profile of Arenosa fine sand, in an area of Nimrod-Arenosa-Patilo fine sands, in woods 150 feet southwest of a county road from a point 0.8 mile southeast of Pilot Knob Church, which is on the county road approximately 2.5 miles south and east of the intersection of the county road and U.S. Highway 377. This intersection is about 5 miles northeast of Stephenville, Tex.

A1—0 to 4 inches, light brownish-gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure to structureless; soft when moist, loose when dry; neutral; clear, smooth boundary.

C1—4 to 30 inches, very pale brown (10YR 8/3) fine sand, very pale brown (10YR 7/3) when moist; structureless, single grain; loose when moist or dry; sand grains are coated with thin brownish material; slightly acid; diffuse, wavy boundary.

C2—30 to 82 inches, pink (7.5YR 8/4) fine sand, pink (7.5YR 7/4) when moist; structureless, single grain; loose when moist or dry; sand grains coated with thin brownish material; medium acid.

The A1 horizon ranges from dark yellowish brown to very pale brown in hue of 10YR, value of 4 to 7, and chroma of 2 to 4. The reaction of this horizon is neutral to slightly acid. The C horizon is pink to very pale brown in hue of 7.5YR or 10YR, value of 7 or 8, and chroma of 3 or 4. It is neutral to medium acid.

Blanket Series

The Blanket series consists of deep, alkaline, loamy soils that have brown clayey lower layers. These soils formed in calcareous clay loam valley fill material. Blanket soils are nearly level to gently sloping and occupy concave valley areas and areas at the heads of drains.

In a representative profile, the surface layer is dark grayish-brown clay loam about 6 inches thick. The next layer is very dark grayish-brown mildly alkaline clay loam about 8 inches thick. Below this are blocky layers that are dark-brown mildly alkaline clay in the upper part and brown calcareous and moderately alkaline clay loam in the lower part. Below a depth of 40 inches is brown calcareous and moderately alkaline clay loam.

Most areas of the Blanket soils are cultivated. These are well drained soils that have moderately slow permeability and a high available water capacity.

Representative profile of Blanket clay loam, 1 to 3 percent slopes, in a field 75 feet north of Farm Road 2803, from a point 0.3 mile west of the intersection of Farm Road 2803 and U.S. Highway 281. This intersection is approximately 8.5 miles north on U.S. Highway 281 from Morgan Mill, Tex.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; mildly alkaline; clear, smooth boundary.

A12—6 to 14 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) when moist; moderate, fine, subangular blocky and granular structure; hard when dry, friable when moist; mildly alkaline; clear, smooth boundary.

B21t—14 to 30 inches, dark-brown (10YR 3/3) clay, very dark brown (10YR 2/3) when moist; moderate, medium, blocky structure; very hard when dry, very firm when moist; distinct clay films; mildly alkaline; gradual, smooth boundary.

B22t—30 to 40 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; moderate, medium, blocky structure; very hard when dry, very firm when moist; patchy clay films; few calcium carbonate threads; calcareous; moderately alkaline; gradual, smooth boundary.

B3—40 to 56 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; hard when dry, firm when moist; many calcium carbonate threads; calcareous; moderately alkaline; gradual, smooth boundary.

C—56 to 72 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 5/3) when moist; massive; hard when dry, firm when moist; many films and threads of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 8 to 18 inches in thickness, from slightly acid to mildly alkaline in reaction, and from very dark gray to dark grayish brown in color. The B2t horizon ranges from 20 to 40 inches in thickness, from neutral to moderately alkaline in reaction, from clay loam to clay in texture, and from dark brown to reddish brown in hue of 5YR to 10YR (mostly 10YR), value of 2 to 5, and chroma of 1.5 to 4. The C horizon is white to brown in hue of 10YR to 2.5Y.

Blanket clay loam, 0 to 1 percent slopes (BaA).—This nearly level soil mainly occupies small, oval to irregular areas in smooth valleys.

The surface layer is dark grayish-brown neutral clay loam about 10 inches thick. The next layer is very dark grayish-brown, alkaline, blocky clay. Below a depth of 44 inches is light-gray calcareous clay loam.

Included with this soil in mapping are small areas of Waurika fine sandy loam and May fine sandy loam. These inclusions are less than 10 percent of the total acreage. Other inclusions are small areas that have an overburden of fine sandy loam that was washed or blown from nearby sandy lands.

Most areas of this Blanket clay loam, 0 to 1 percent slopes, are cultivated. (Capability unit I–1; Deep Upland range site)

Blanket clay loam, 1 to 3 percent slopes (BaB).—This gently sloping soil is in concave areas in valleys. Most areas are oval to irregular and 6 to 20 acres in size.

This soil has the profile described as representative for the series.

Included in mapped areas of this soil are areas of Blanket clay loam that have a 2 to 5 inch overburden of fine sandy loam.

Most areas of this Blanket clay loam, 1 to 3 percent slopes, are cultivated. (Capability unit IIe–1; Deep Upland range site)

Blanket clay loam, 1 to 5 percent slopes, severely eroded (BaC3).—This soil occupies irregular areas in val-

leys. These areas have gullies 1 to 4 feet deep at points of water concentration. Erosion ranges from slight between the gullies to severe near the gullies.

The dark grayish-brown clay loam surface layer averages less than 7 inches in thickness and is underlain by dark grayish-brown to brown blocky clay.

Included with this soil in mapping are small irregular shaped areas between the gullies that have 10 to 12 inches of surface layer remaining.

Most areas of this Blanket clay loam, 1 to 5 percent slopes, severely eroded, have been farmed at one time but are now used for pasture or range. (Capability unit VIe–1; Deep Upland range site)

Bolar Series

The Bolar series consists of moderately deep, calcareous, loamy soils that have a high percentage of lime in the lower layers. These gently sloping to sloping soils occupy convex areas on uplands.

In a representative profile, the surface layer is brown to dark-brown calcareous clay loam about 16 inches thick. Below the surface layer, to a depth of 32 inches, is pale-brown to very pale brown clay loam that has a high lime content. The underlying layers are interbedded limestone and calcareous marl.

Many areas of the Bolar soils are used for range; some are cultivated. These soils are well drained, have moderate permeability, and have a moderate available water capacity.

Representative profile of Bolar clay loam, in an area of Bolar-Denton complex, 3 to 5 percent slopes, in the north edge of a field, 80 yards east of Farm Road 914, from a point 5.6 miles south of the junction of Loop 195 and Farm Road 914 at the south edge of Stephenville, Tex.

Ap—0 to 6 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky and granular structure; hard when dry, friable when moist; few fine calcium carbonate fragments; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—6 to 16 inches, dark-brown (10YR 3/3) clay loam, very dark brown (10YR 2/3) when moist; moderate, fine, subangular blocky and granular structure; hard when dry, friable when moist; few fine calcium carbonate fragments; calcareous; moderately alkaline; clear, smooth boundary.

B21—16 to 28 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 5/3) when moist; moderate, fine, subangular blocky and granular structure; hard when dry, friable when moist; common fine calcium carbonate concretions and fragments; calcareous; moderately alkaline; gradual, smooth boundary.

B22—28 to 32 inches, very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) when moist; moderate, fine, granular structure; hard when dry, friable when moist; many fine calcium carbonate concretions and fragments; calcareous; moderately alkaline; clear, smooth boundary.

C—32 to 36 inches, interbedded yellowish-brown marl and limestone fragments; calcareous; moderately alkaline; abrupt, smooth boundary.

R—36 to 44 inches, indurated limestone bedrock, somewhat interbedded with clay marl.

The A horizon ranges from 12 to 20 inches in thickness. In color it ranges from grayish brown to very dark brown in hue of 7.5YR or 10YR, value of 2.5 to 5, and chroma of 2 or 3.

The B2 horizons range from light olive brown to yellowish brown or grayish brown in hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 2 to 4. The clay content of these horizons is 22 to 35 percent, and carbonate content is 40 to 60 percent by volume. B2 horizons that have broken stone lines are common.

The limestone bedrock underlying the solum, at depths of 20 to 48 inches, ranges from thinly bedded limestone and marly clay to thick beds of limestone and clayey marl.

Bolar clay loam, 3 to 5 percent slopes, eroded (BcC2).—This gently sloping, eroded soil occurs on convex uplands in irregular areas mainly less than 40 acres in size. Shallow gullies that expose the lower layers dissect the area at 75 to 125 foot intervals. These gullies mainly are in cultivated fields.

The surface layer is brown calcareous clay loam about 12 inches thick. Below the surface layer is a pale-brown, granular, calcareous clay loam. Below a depth of 30 inches is interbedded limestone and yellowish brown marl.

Included in mapped areas of this soil are shallow areas of Purves and Dugout soils. These inclusions make up less than 10 percent of any area of this soil.

Most areas of this Bolar clay loam were once farmed, but now the fields have been reseeded to grass. (Capability unit IIIe–1; Deep Upland range site)

Bolar-Denton complex, 3 to 5 percent slopes (BdC).—This mapping unit is made up of gently sloping soils that lie in convex areas on uplands. Areas of this unit are irregular and mostly less than 40 acres in size. The soils occur in intricate patterns that make separation impractical. Mapped areas contain about 55 percent Bolar clay loam, 35 percent Denton silty clay, and 10 percent inclusions of other soils.

The Bolar soil in this unit has the profile described as representative for the Bolar series.

Denton soils have a very dark grayish-brown to brown, calcareous silty clay surface layer about 24 inches thick. Below the surface layer is a grayish-brown calcareous silty clay. The underlying material, below a depth of about 35 inches, is interbedded limestone and calcareous marl.

Included in this mapping unit are small areas of shallow Purves and Dugout soils.

Most areas of this Bolar-Denton complex were farmed at one time but have been returned to grass. (Capability unit IIIe–1; Deep Upland range site)

Bonti Series

The Bonti series consists of moderately deep loamy soils that are clayey in the lower part. These gently sloping to sloping stony soils occupy convex ridgetops.

In a representative profile, the surface layer is brown slightly acid fine sandy loam that contains a few sandstone fragments on the surface and common sandstone fragments within the horizon. The subsurface layer is a light-brown medium acid fine, sandy loam. The lower layers are red, firm, medium acid clay in the upper part and yellowish-red medium acid clay loam in the lower part. The underlying material, at a depth of about 30 inches, is weakly to strongly cemented brownish-yellow sandstone (fig. 4).

Most areas of the Bonti soils are in wooded native range. These soils are well drained, have moderately slow

Figure 4.—**Profile of Bonti stony fine sandy loam. Hard sandstone is at a depth of about 30 inches.**

permeability, and have a moderate available water capacity.

Representative profile of Bonti stony fine sandy loam, in an area of Bonti-Exray stony fine sandy loams, in a wooded pasture 100 feet west of a county road, from a point 1.4 miles north on the county road from the intersection of two county roads at Russell Chapel Cemetery. This intersection is 3 miles north on the county road from its intersection with Farm Road 1715, which is 4.5 miles northeast of the intersection of Farm Road 1715 and State Highway 108 and about 14.5 miles north-northwest of Stephenville, Tex.

A1—0 to 4 inches, brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky structure; few sandstone fragments on the surface and common sandstone fragments in the horizon; slightly hard when dry, friable when moist; slightly acid; clear, smooth boundary.

A2—4 to 8 inches, light-brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; medium acid; clear, smooth boundary.

B21t—8 to 20 inches, red (2.5YR 4/6) clay, dark red (2.5YR 3/6) when moist; moderate, very fine and fine, blocky structure; very hard when dry, firm when moist; distinct clay films on ped faces; medium acid; gradual, smooth boundary.

B22t—20 to 30 inches, yellowish-red (5YR 5/6) clay loam, yellowish red (5YR 4/6) when moist; few, fine, distinct, dark-red mottles; moderate, fine, blocky structure; very hard when dry, firm when moist; distinct clay films on peds; medium acid; abrupt, smooth boundary.

R—30 to 32 inches, brownish-yellow, weakly to strongly cemented, acid sandstone.

The A horizon ranges from 4 to 10 inches in thickness. The A1 horizon ranges from dark brown to light brown in hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. The A2 horizon ranges from very weakly expressed where the A horizon is thin to prominent where the A horizon is thick. The A2 horizon is 1 to 2 units higher in color value than the overlying A1 horizon and has a reaction ranging from neutral to medium acid.

The B2t horizon ranges from 16 to 34 inches in thickness, from clay loam to clay in texture, and from moderate, fine, subangular blocky to very fine and fine blocky in structure. The upper part of the B2t horizon is unmottled and ranges from dark red to yellowish red in hue of 2.5YR, value of 3 to 5, and chroma of 6 to 8. The lower part of the B2t horizon is yellowish red to reddish yellow in hue of 7.5YR to 5YR and has red and yellow mottles. The reaction of the B horizon ranges from strongly acid to medium acid.

The R layer is 20 to 40 inches below the surface. This range in depth can occur in a short distance. The underlying sandstone is wavy and ranges from weakly cemented to indurated (fig. 5).

Bonti-Exray stony fine sandy loams (Be).—This mapping unit consists of shallow to moderately deep, stony soils. Mapped areas are about 60 percent Bonti soils, 30 percent Exray soils, and 10 percent inclusions of other soils. The soils are in mixed, irregular patterns that make separation impractical. These gently sloping to sloping soils lie on upland ridges or hilltops. Slopes range from 1 to 8 percent. From 1 to 15 percent of the soil surface is covered with sandstone fragments 3 inches to 3 feet in diameter. Rock fragments are common throughout the profile.

The Bonti soil in this unit has the profile described as representative for the Bonti series.

The Exray soil in this unit has the profile described as representative for the Exray series.

Included in areas of this mapping unit are small areas of Truce stony fine sandy loam, 5 to 40 percent slopes, and Owens stony clay, 3 to 20 percent slopes. Rock outcrops also are included.

About 60 percent or more of this mapping unit is too stony for cultivation. The remaining areas are so small and irregularly shaped that cultivation is impractical. These soils are best suited to native grass. (Capability unit VIe-5; Sandy Loam range site)

Bosque Series

The Bosque series consists of deep, calcareous, loamy soils of the bottom lands. These nearly level soils formed in calcareous loamy alluvium and occupy bands along the flood plains of streams. They are occasionally flooded.

In a representative profile, the surface layer is dark grayish-brown calcareous loam about 20 inches thick. Below the surface layer, to a depth of 50 inches, is a dark-brown to brown calcareous clay loam. The underlying material is dark grayish-brown, calcareous, firm clay.

Figure 5.—**Wavy strata of sandstone under Bonti stony fine sandy loam.**

Most areas of the Bosque soils are cultivated. Some areas are in pasture and pecan trees. These soils are well drained; permeability is moderate, and the available water capacity is high.

Representative profile of Bosque loam, occasionally flooded, in a field 30 yards south-southeast of a county road, which is 0.3 mile east of the intersection of the county road and Farm Road 8. This intersection is 6.4 miles west of the intersection of Farm Road 8 and Texas Highway 108 in the north edge of Stephenville, Tex.

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; calcareous; moderately alkaline; abrupt, smooth boundary.

A12—5 to 20 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; weak, fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; common threads and films of calcium carbonate; many pores and worm casts; calcareous; moderately alkaline; gradual, smooth boundary.

A13—20 to 38 inches, dark-brown (10YR 3/3) clay loam, very dark brown (10YR 2/3) when moist; weak, fine, subangular blocky structure; hard when dry, firm when moist; common threads and films of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B2—38 to 50 inches, brown (10YR 5/3) clay loam, brown (10YR 4/3) when moist; very few, fine, faint, dark yellowish-brown mottles; weak, fine, subangular blocky structure; very hard when dry, firm when moist; common threads and films of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—50 to 60 inches, dark grayish-brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) when moist; few, fine, faint, brown mottles and streaks; very hard when dry, firm when moist; many threads and films of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 20 to 40 inches in thickness. In color it ranges from brown to grayish brown to very dark grayish brown in a hue of 10YR, value of 3 to 5, and chroma of 2 or 3. Reaction ranges from mildly alkaline to moderately alkaline and calcareous. Threads and films of calcium carbonate range from few to common. The clay content of the material between depths of 10 and 40 inches is 18 to 35 percent.

The B horizon ranges from loam to clay loam in texture. In color it ranges from dark brown to very pale brown in a hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 to 4.

The C horizon ranges from loam to clay in texture and from very dark grayish brown to pale brown in color.

Bosque loam, occasionally flooded (Bo).—This nearly level soil occurs as bands along major streams in areas 10 to several hundred acres in size.

Included with mapped areas of this soil are small areas of Venus loam, Frio clay loam, occasionally flooded, and Bunyan fine sandy loam, occasionally flooded. These included areas comprise less than 15 percent of any area of this soil.

Most areas of this Bosque loam are cultivated. They lie in a favorable position to receive extra water. Floods occur about once in 4 to 10 years but do not limit use for crops. Most of the floods come early in spring before crops are planted. (Capability unit I-1; Bottomland range site)

Brackett Series

The Brackett series consists of shallow loamy soils that have a high lime content. These soils formed in calcareous gravelly loam underlain by soft limestone. They are in narrow bands, mainly along limestone escarpments.

In a representative profile, the surface layer is pale-brown calcareous gravelly clay loam about 6 inches thick. Below the surface layer, to a depth of 16 inches, is a granular, calcareous, pale-yellow gravelly clay loam. Below a depth of 16 inches, the underlying material is soft interbedded limestone and marl.

The Brackett soils are used for native grass range. They are well drained, have moderately slow permeability, and are subject to rapid runoff. Their available water capacity is low.

Representative profile of Brackett gravelly clay loam, in an area of Brackett-Purves complex, in a pasture 50 yards north of a county road, from a point 3.9 miles northwest on the county road from its intersection with Farm Road 219. This intersection is 0.55 mile north-northwest on Farm Road 219 from the junction of Farm Road 219 and Farm Road 2303. This junction is about 8.5 miles northwest of Stephenville, Tex.

A1—0 to 6 inches, pale-brown (10YR 6/3) gravelly clay loam, brown (10YR 4/3) when moist; strong, very fine, granular structure; 20 percent shell fragments and limestone fragments the size of fine gravel; slightly hard when dry, friable when moist; calcareous; moderately alkaline; clear, wavy boundary.

B2—6 to 16 inches, pale-yellow (2.5Y 7/4) gravelly clay loam, light olive brown (2.5Y 5/4) when moist; strong, very fine, granular structure; about 30 percent shell fragments and limestone fragments the size of fine gravel; slightly hard when dry, friable when moist; calcareous; moderately alkaline; clear, wavy boundary.

C1—16 to 30 inches, interbedded soft limestone, shell fragments, and marl; calcareous; moderately alkaline; clear boundary.

IIC2—30 to 40 inches, light olive-brown and olive-yellow clays; calcareous; moderately alkaline.

The A horizon ranges from 4 to 10 inches in thickness. Color ranges from very pale brown to brown in a hue of 10YR, value of 4 to 7, and chroma of 1.5 to 3. Limestone gravel fragments, on the surface and within the horizon, make up from 5 to 35 percent of the A horizon.

The B2 horizon ranges from 6 to 12 inches in thickness and from loam to clay loam in texture. Color ranges from light gray to pale yellow in hue of 10YR to 2.5Y, value of 5 to 8, and chroma of 1.5 to 4. Gravel fragments make up from 5 to 35 percent of the horizon. The C horizon is light brownish-gray to very pale brown, interbedded, soft limestone and marl that is more than 50 percent calcium carbonate.

Brackett-Dugout complex, 8 to 40 percent slopes (BrF).—This mapping unit is made up of shallow, loamy, stony and gravelly soils. These strongly sloping to steep soils have a 2 to 15 percent cover of limestone fragments that range in size from 1 inch to 2 feet in diameter. The areas have a benched or stairstep appearance.

Mapped areas of this unit are composed of about 39 percent Brackett gravelly clay loam; 18 percent Dugout gravelly and stony clay loam; 17 percent Maloterre stony clay loam; 14 percent Bolar stony clay loam; and about 12 percent inclusions of other soils. These soils are in narrow bands 50 to 200 feet wide, and separation is impractical. Dugout and Maloterre soils occupy the benches between steeper bands of Brackett and Bolar soils.

Brackett and Dugout soils have a pale-brown to light brownish-gray, calcareous, granular gravelly clay loam surface layer about 6 inches thick. The next layers are very pale brown to pale-yellow, granular, calcareous clay loam. Below a depth of 16 inches, Brackett soils are underlain by interbedded soft limestone and marl. Dugout soils are underlain by hard limestone at a depth of 18 inches.

Bolar soils have a brown, granular, calcareous clay loam surface layer about 12 inches thick. The next layer is pale-brown, granular, calcareous clay loam. Below a depth of 30 inches, the underlying material is interbedded limestone and marl.

Maloterre soils are very shallow calcareous soils about 8 inches deep over hard limestone.

Included in areas of this mapping unit are narrow bands, 25 to 50 feet wide, of a soil similar to Brackett soils, except that it is underlain by olive-yellow clays. Also included are limestone rock outcrops. (Capability unit VIIs-1; Limestone Hills range site)

Brackett-Purves complex (Bt).—This mapping unit consists of loamy and clayey, shallow, stony soils. These strongly sloping to steep soils have a 5 to 40 percent surface cover of flat limestone fragments that range in size from 1 inch to 3 feet. The landscape has a distinct benched or stairstep appearance, and slopes range from 5 to 40 percent.

Mapped areas contain about 35 percent Brackett gravelly and stony clay loam; 35 percent Purves stony clay; 15 percent Maloterre soils; and about 15 percent inclusions of Dugout soils, unclassified soils, and rock outcrops. These soils occur in bands 50 to 100 feet wide that make separations impractical. The Purves and Maloterre soils occupy the benches between the steeper areas of Brackett soils.

The Brackett soil in this unit has the profile described as representative for the Brackett series.

Purves soils have a dark grayish-brown, calcareous, granular clay surface layer that is 6 to 15 inches thick and rests abruptly on hard limestone.

Maloterre soils have a calcareous clay loam surface layer about 8 inches thick that is underlain by hard limestone. (Capability unit VIIs-1; Limestone Hills range site)

Bunyan Series

The Bunyan series is made up of deep stratified soils of the bottom lands. These soils formed in stratified loamy alluvium along the flood plains of streams. They flood occasionally to frequently.

In a representative profile, the surface layer is a light brownish-gray, neutral to slightly acid fine sandy loam about 10 inches thick. Below the surface layer, to a depth of 46 inches, are grayish-brown, very dark grayish-brown, and pale-brown stratified clay loam, fine sandy loam, and sandy clay loam (fig. 6). These layers are neutral to medium acid in the upper part and moderately alkaline in the lower part. Below a depth of 46 inches is gray moderately alkaline clay loam.

Many areas of the Bunyan soils are cultivated; other areas are in pasture and pecan trees. These soils are well drained, have moderate permeability, and have a high available water capacity.

Representative profile of Bunyan fine sandy loam, occasionally flooded, in a field 150 yards east of a county road, from a point 0.5 mile northwest of the intersection of the county road and U.S. Highway 377. This intersection is 9.5 miles southwest of the Erath County courthouse in Stephenville, Tex.

Ap—0 to 10 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; massive; porous; hard when dry, friable when moist; neutral; abrupt, smooth boundary.

C1—10 to 16 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) when moist; weak, fine, subangular blocky structure; hard when dry, firm when moist; medium acid; abrupt, smooth boundary.

C2—16 to 22 inches, grayish-brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) when moist; structureless; hard when dry, firm when moist; breaks to fragments; thin strata of fine sandy loam and clay loam that have evident bedding planes; mildly alkaline; abrupt, smooth boundary.

C3—22 to 46 inches, pale-brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) when moist; structureless; hard when dry, firm when moist; bedding planes same as C2 horizon; moderately alkaline; abrupt, smooth boundary.

C4—46 to 54 inches, gray (10YR 6/1) clay loam, dark gray (10YR 4/1) when moist; few, fine, yellowish-brown mottles; structureless; hard when dry, firm when moist; moderately alkaline; clear, smooth boundary.

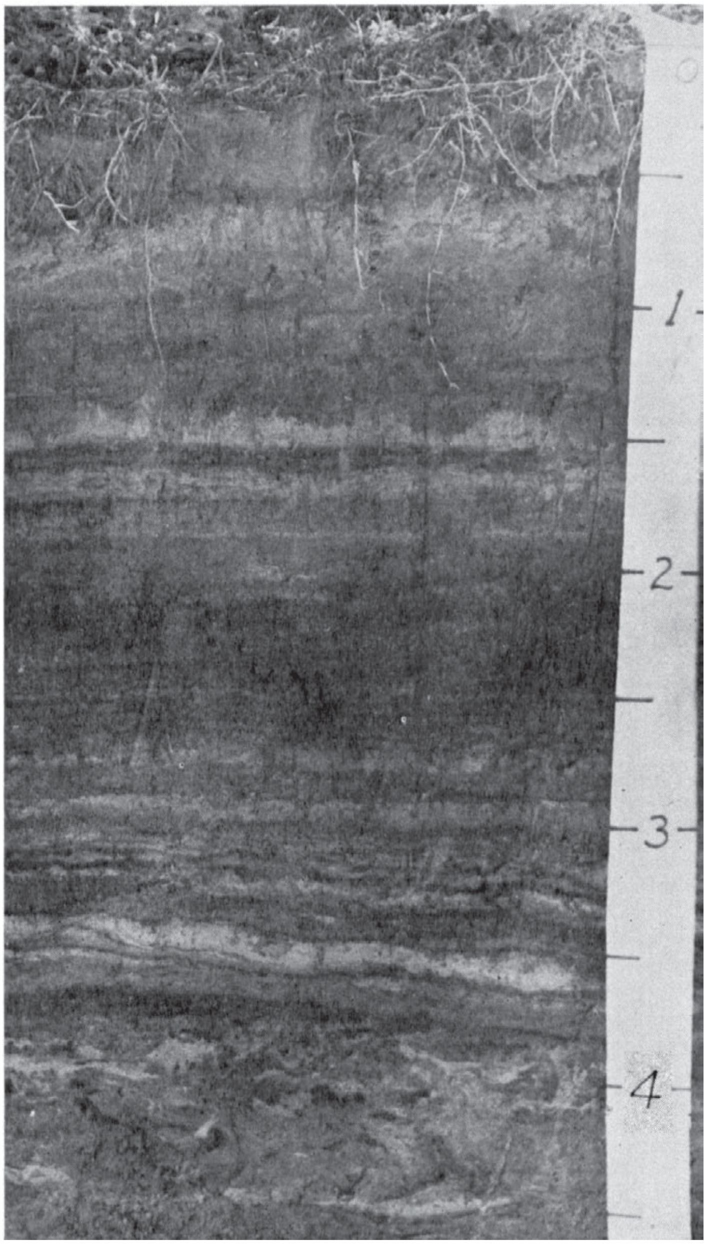


Figure 6.—**Stratification in profile of Bunyan fine sandy loam.**

C5—54 to 62 inches, gray (10YR 6/1) clay loam, gray (10YR 5/1) when moist; few, fine, yellowish-brown mottles; structureless; hard when dry, firm when moist; moderately alkaline.

The color of the A horizon ranges from light brownish gray to brown in hue of 7.5YR or 10YR. Reaction ranges from slightly acid to neutral. In places, thin layers below the surface are darker than the surface. The overall texture between the depths of 10 and 40 inches ranges from fine sandy loam to clay loam, and the clay content from 18 to 35 percent. Stratification varies. The reaction of the C horizons ranges from medium acid in the upper part to moderately alkaline and calcareous in the lower part. Interbedded calcareous and noncalcareous strata are common.

Bunyan fine sandy loam, occasionally flooded (Bu).—This is a deep, loamy, moderately permeable soil of the bottom lands. It formed in loamy alluvial sediments. Slopes range from 0 to 2 percent.

This soil has the profile described as representative for the series.

Many areas of this soil are cultivated. These areas are subject to occasional damaging floods that follow periods of heavy rainfall. The areas flood once in 4 to 10 years; however, most floods occur during the early spring before crops are planted. (Capability unit I–1; Bottomland range site)

Bunyan soils, frequently flooded (By).—This is a deep, nearly level, moderately permeable soil of the bottom lands. Slopes range from 0 to 2 percent.

The surface layer ranges from loamy fine sand to sandy clay loam. The underlying layers are stratified fine sandy loam, clay loam, and sandy clay loam. Below a depth of 40 inches are alkaline fine sandy loam and sandy clay loam.

Most areas of these Bunyan soils, frequently flooded, are in pasture and pecan trees. They are subject to frequent damaging floods and are not suitable for cropland. They flood more often than once in 4 years, and the rapidly flowing floodwaters cause scouring and leave sediment deposits. (Capability unit Vw–1; Bottom land range site)

Chaney Series

The Chaney series consists of deep acid soils that have a sandy surface layer and mottled sandy clay lower layers. These are gently sloping to sloping soils of the uplands.

In a representative profile, the 4 inch surface layer is a dark grayish-brown, medium acid loamy sand. The next layer is light-gray, medium acid loamy sand. The underlying layers, to a depth of 52 inches, are mottled in shades of red, brown, yellow, and gray. They are medium acid sandy clay that grades to clay loam in the lower part. Below a depth of 52 inches is olive-gray shaly clay.

Most of these Chaney soils are cultivated; some areas are in pasture. These soils are moderately well drained, and permeability is slow. Runoff is solw to medium, and the available water capacity is high.

Representative profile of Chaney loamy sand, 1 to 5 percent slopes, in a wooded pasture 200 feet south of a county road, from a point 1.05 miles east of the intersection of the county road and U.S. Highway 281. This intersection is 9 miles north of Morgan Mill, Tex., and 20 miles north of Stephenville, Tex., on U.S. Highway 281.

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; slightly hard when dry, friable when moist; few, fine, rounded quartz pebbles; medium acid; clear, smooth boundary.

A2—4 to 14 inches, light-gray (10YR 7/2) loamy sand, grayish brown (10YR 5/2) when moist; structureless; single grain; slightly hard when dry, very friable when moist; few rounded quartz pebbles; medium acid; abrupt, wavy boundary.

B21t—14 to 22 inches, dark-red (2.5YR 3/6) sandy clay, dark red (2.5YR 3/6) when moist; common, fine, distinct, pale-brown and light brownish-gray mottles; weak, medium, blocky structure; very hard when dry, very firm when moist; continuous clay films; few fine

chert fragments; medium acid; clear, wavy boundary.

B22t—22 to 34 inches, mottled red (2.5YR 4/6), light yellowish-brown (10YR 6/4), and light brownish-gray (10YR 6/2) sandy clay; weak, medium, blocky structure; very hard when dry, very firm when moist; continuous clay films; few fine chert fragments; medium acid; gradual, wavy boundary.

B3t—34 to 40 inches, brownish-yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) when moist; common, medium, distinct, red, pale-brown, and light brownish-gray mottles; weak, coarse, blocky structure; very hard when dry, firm when moist; patchy clay films; medium acid; gradual, wavy boundary.

C1—40 to 52 inches, light brownish-gray (2.5Y 6/2) clay loam, light brownish gray (2.5Y 6/2) when moist; few, fine, faint, olive-yellow (2.5Y 6/6) mottles; structureless; few soft masses of white material; medium acid; gradual, wavy boundary.

IIC2—52 to 72 inches, olive-gray (5Y 5/2) shaly clay, olive gray (5Y 5/2) when moist; evident bedding planes; numerous soft masses of white material; slightly acid.

The A horizon ranges from 8 to 20 inches in thickness and from neutral to medium acid in reaction. Color of the A1 horizon ranges from very pale brown to dark grayish brown in hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 or 3. The A2 horizon is brownish yellow to light gray in hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 2 to 6.

The B2t horizons range from sandy clay to clay in texture, from slightly acid to medium acid in reaction, and from weak to moderate, medium to coarse blocky in structure. The color ranges from olive brown to dark red in hue of 2.5YR to 2.5Y. Mottles are pale brown, red, gray, yellowish brown, and brown.

The B3 horizon is a mottled yellow, red, pale brown, and gray sandy clay loam. The C horizon ranges from massive reddish gravelly clay to light olive-gray mottled sandy clay, clay loam, or shaly clay.

Chaney loamy sand, 1 to 5 percent slopes (ChC).—This gently sloping soil occupies sandy irregular areas on uplands.

This soil has the profile described as representative for the series.

Included in mapped areas of this soil are small areas of Windthorst loamy very fine sand, 1 to 5 percent slopes, and Demona loamy sand, 0 to 5 percent slopes. These inclusions occupy less than 15 percent of any mapped area of this soil.

Most areas of this Chaney loamy sand, 1 to 5 percent slopes, are in range or pasture. A few areas are cultivated. (Capability unit IIIe–3; Sandy range site)

Chaney stony loamy sand (Cn).—This sandy, gently sloping to sloping, stony soil is on uplands and has slopes of from 1 to 8 percent.

The loamy sand surface layer is about 16 inches thick and has a 1 to 10 percent cover of conglomerate sandstone fragments from 2 inches to 4 feet in diameter. The stones are loose and are not part of a continuous sandstone strata. The next lower layers are red, gray, and yellowish-brown acid sandy clay. The underlying material, below a depth of 50 inches, is an alkaline, red shaly clay. Included in mapped areas of this soil are small areas of Windthorst and Demona soils that make up less than 15 percent of any mapped area.

This Chaney stony loamy sand is used for range. It is too stony for cultivation. Little bluestem is the most common grass grown. (Capability unit VIe–4; Sandy range site)

Chaney soils, 1 to 5 percent slopes, eroded (CoC2).—These eroded gently sloping soils are in small, irregular, convex areas on uplands.

Part of the original surface layer has been removed by erosion, and the present surface layer in many places is a mixture of the surface soil and underlying layers. In shallow gullies and on low knolls, the lower layers are commonly exposed. The surface layer is about 6 inches thick and ranges from sandy clay loam to loamy sand. Below the surface layer is a red, yellowish-brown, and light-gray mottled acid sandy clay. Below a depth of about 42 inches is an acid sandy clay loam mottled with brown, yellow, and gray.

Included in mapped areas of these soils are small areas of Windthorst loamy very fine sand, 1 to 5 percent slopes, that make up less than 15 percent of any mapped area.

Most areas of these Chaney soils were once cultivated. Now, many old fields are in grass. These soils are best suited to range, but some crops are still grown. (Capability unit IVe–5; Sandy Loam range site)

Crawford Series

The Crawford series consists of moderately deep clay soils. These soils are of minor extent in the county. They occupy gently sloping convex hilltops. Undisturbed areas have pronounced microrelief consisting of alternating basins and microknolls.

In a representative profile, the 5 inch surface layer is a dark-brown clay. The next layer is dark reddish-brown slightly acid clay about 16 inches thick. The next layer, to a depth of 30 inches, is calcareous clay. The underlying material, below 30 inches, is hard limestone bedrock.

Most areas of Crawford soils are used for native range. These soils crack and take water readily when dry, but permeability is very slow when they are wet. Their available water capacity is high.

Representative profile of Crawford clay in a wooded area 300 feet west of a barn site that is 7.5 miles north on a private road from its intersection with a county road. This intersection is 5.1 miles southwest and 1 mile east of the intersection of the county road and Texas Highway 220. This intersection is 4.9 miles southwest from the junction of U.S. Highway 67 and Texas Highway 220, which is 18.4 miles southeast on U.S. Highway 67 from the Erath County courthouse in Stephenville, Tex.

A11—0 to 5 inches, dark-brown (7.5YR 3/2) clay, same color when moist; strong, fine, subangular blocky structure; very hard when dry, firm when moist; medium acid; gradual, smooth boundary.

A12—5 to 21 inches, dark reddish-brown (5YR 3/3) clay, same color when moist; strong, medium, blocky structure parting to strong, fine, wedge-shaped peds; grooved shiny surfaces on the faces of shear planes; extremely hard when dry, firm when moist; slightly acid; gradual, wavy boundary.

A13—21 to 27 inches, dark reddish-brown (5YR 3/3) clay, same color when moist; strong, fine, subangular blocky structure; grooved shiny surfaces on the faces of shear planes; hard when dry, firm when moist; calcareous; moderately alkaline; many fine limestone fragments; clear, wavy boundary.

C—27 to 30 inches, light reddish-brown (5YR 6/4) clay, reddish yellow (5YR 6/6) when moist; strong, fine, subangular blocky structure; hard when dry, firm

when moist; contains many, small, hard, secondary calcium concretions; calcareous; moderately alkaline; abrupt, smooth boundary.

R—30 to 33 inches, hard limestone.

The A11 horizon ranges from 4 to 6 inches in thickness. Color ranges from dark reddish brown to very dark grayish brown in hue of 5YR to 10YR. The A12 horizon is 14 to 20 inches thick and dominantly dark reddish brown in hue of 2.5YR or 5YR. Slickensides range from few to common.

The A13 horizon ranges from 4 to 10 inches in thickness. This horizon typically has a few limestone fragments, but some pedons are 10 to 35 percent limestone fragments. Slickensides range from few to common. The C horizon ranges from 0 to 4 inches in thickness. The soil is from 20 to 36 inches deep over indurated limestone.

Crawford clay, 1 to 3 percent slopes (CrB).—This gently sloping soil occupies small oval hilltops. It is of minor extent in Erath County. Most areas of this soil are used for native range. (Capability unit IIe–2; Redland range site)

Demona Series

The Demona series consists of deep sandy soils that have red, yellow, brown, and gray mottled lower layers. These are nearly level to gently sloping soils of the sandy uplands.

In a representative profile, the 4 inch surface layer is grayish-brown loamy sand. The subsurface layer is light-brown slightly acid loamy sand about 20 inches thick. It contains a few, rounded, sandy pebbles. The next layers, to a depth of 56 inches, are strongly acid sandy clay mottled in shades of red, gray, brown, and yellow. They grade to sandy clay loam in the lower part. Below 56 inches is a light-gray, medium acid sandy clay.

Demona soils are mostly used for native range or pasture. Some areas are cultivated. These soils are well drained, have moderately slow permeability, and have slow to moderate runoff. Their available water capacity is moderate.

Representative profile of Demona loamy sand in a pasture 800 feet north of an east-west county road, from a point 4.4 miles west of a junction with a county road. This junction is 3 miles west-northwest on the county road from its intersection with Texas Highway 108. The intersection of the county road with Texas Highway 108 is 0.9 mile north of the Hannibal store and 17.5 miles northwest of the Erath County courthouse in Stephenville, Tex.

A1—0 to 4 inches, grayish-brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) when moist; structureless; slightly hard when dry, very friable when moist; contains a few, rounded, siliceous pebbles; forms hard massive surface crusts on drying; neutral; clear, smooth boundary.

A2—4 to 24 inches, light-brown (7.5YR 6/4) loamy sand, brown (7.5YR 5/4) when moist; structureless; slightly hard when dry, loose when moist; contains a few, rounded, siliceous pebbles; slightly acid; abrupt, wavy boundary.

B21t—24 to 33 inches, red (2.5YR 5/8) sandy clay, red (2.5YR 4/8) when moist; common, medium, distinct, reddish-brown, light-gray, and brownish-yellow mottles; weak, coarse, blocky structure; very hard when dry, very firm when moist; continuous clay films; strongly acid; gradual, wavy boundary.

B22t—33 to 48 inches, light-gray (10YR 7/1) sandy clay, gray (10YR 6/1) when moist; many, medium, distinct, red and brownish-yellow mottles; weak, coarse, blocky structure; very hard when dry, very firm when moist; continuous clay films; strongly acid; gradual, wavy boundary.

B3t—48 to 56 inches, red (2.5YR 5/8) sandy clay loam, red (2.5YR 4/8) when moist; common, fine, distinct, gray and brownish-yellow mottles; weak, coarse, blocky structure; hard when dry, friable when moist; strongly acid; gradual, wavy boundary.

C—56 to 64 inches, light-gray (10YR 7/1) sandy clay, gray (10YR 6/1) when moist; few, fine, brownish-yellow mottles; structureless; medium acid.

The loamy sand A horizon ranges from 20 to 40 inches in thickness. The A1 horizon ranges from neutral to mildly alkaline in reaction. Color ranges from very pale brown to yellowish brown in hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 2 to 4. The A2 horizon is neutral to medium acid and reddish yellow to very pale brown in hue of 7.5YR or 10YR, value of 6 or 7, and chroma of 3 to 6. The lower boundary of this horizon is wavy in many places.

The B21t horizon ranges from sandy clay to clay in texture, from weak coarse blocky to moderate fine blocky in structure, and in color from yellowish red to red in hue of 5YR to 2.5YR. This horizon contains gray, yellowish-brown, reddish-brown, and brown mottles. In low areas, the gray and yellowish mottles predominate over the red.

The B22t horizon ranges from sandy clay to sandy clay loam in texture. Color ranges from olive brown to light reddish brown in hue of 2.5YR to 2.5Y, value of 4 to 7, and chroma of 1 to 8. This horizon contains red, gray, and yellow mottles. The B3t horizon is sandy clay to sandy clay loam that is mottled in shades of red, brown, gray, and yellow. The C horizon is reddish sandy clay loam to light-gray mottled clay.

Demona loamy sand, 0 to 5 percent slopes (DaC).—This soil occupies sandy irregular areas on uplands. It is characterized by an undulating landscape that has mixed concave and convex surfaces.

Included with this soil in mapping are small areas of Chaney loamy sand, 1 to 5 percent slopes, and Patilo fine sand. These inclusions make up less than 15 percent of any area of this soil.

Most areas of this Demona loamy sand are in range or pasture, but some areas are cultivated. (Capability unit IIIe–4; Sandy range site)

Denton Series

The Denton series consists of moderately deep, calcareous, clayey soils. These gently sloping soils are on uplands.

In a representative profile, the 6-inch surface layer is calcareous silty clay that is very dark grayish brown. The next layer is dark grayish-brown silty clay 4 inches thick. The next layer, to a depth of 28 inches, is brown silty clay. Below this layer, to a depth of 38 inches, is calcareous silty clay that grades to silty clay loam in the lower part. The underlying material, below a depth of 38 inches, is interbedded limestone and marl (fig. 7).

Most areas of Denton soils are cultivated. Some areas are in native grass pasture. These soils are well drained, have slow permeability, and have a high available water capacity.

Representative profile of Denton silty clay, 1 to 3 percent slopes, in a cultivated field 180 feet west of Farm Road 219, from a point 6.4 miles south of Purves, Tex.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) silty clay, very dark grayish brown (10YR 3/2) when moist; moderate, very fine, subangular blocky and granular structure; hard when dry, firm when moist;

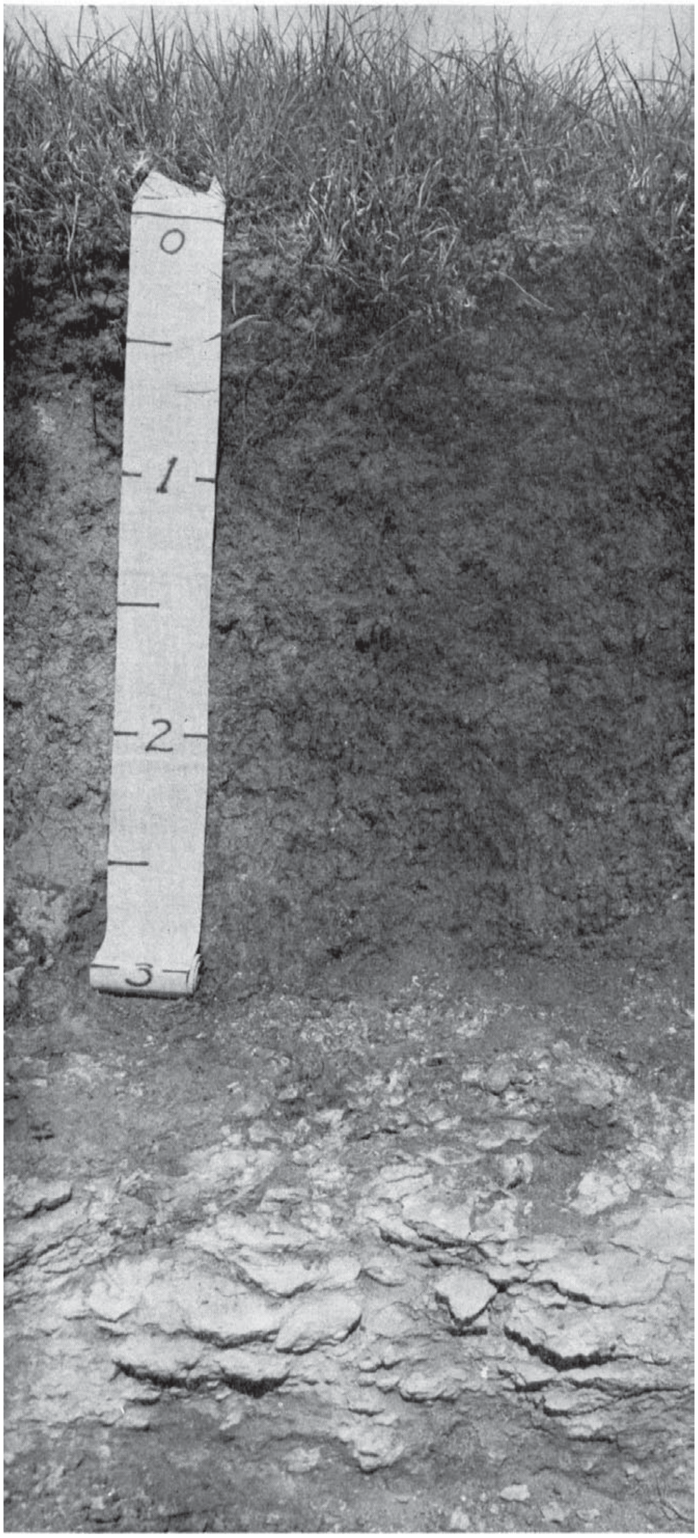


***Figure 7.*—Profile of Denton silty clay.**

calcareous; moderately alkaline; abrupt, smooth boundary.

A12—6 to 10 inches, dark grayish-brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) when moist; moderate, very fine, subangular blocky and granular structure; hard when dry, firm when moist; calcareous; moderately alkaline; clear, wavy boundary.

A13—10 to 28 inches, brown (7.5YR 4/2) silty clay, dark brown (7.5YR 3/2) when moist; moderate and strong, very fine, blocky and granular structure; hard when dry, firm when moist; calcareous; moderately alkaline; gradual, wavy boundary.

B2—28 to 32 inches, grayish-brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) when moist; moderate and strong, very fine, blocky structure; hard when dry, firm when moist; calcareous; moderately alkaline; clear, wavy boundary.

C—32 to 38 inches, light-gray (10YR 7/2) silty clay loam, light brownish gray (10YR 6/2) when moist; common calcium carbonate concretions up to ½ inch in diameter and limestone fragments up to 2 inches in diameter; calcareous; moderately alkaline; abrupt, wavy boundary.

R—38 to 40 inches, thinly bedded indurated limestone and marl.

The A horizon ranges from 20 to 34 inches in thickness. Color ranges from brown to very dark grayish brown in hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3. The structure of the A horizon is moderate to strong subangular blocky, blocky, and granular.

The B2 horizon is weakly expressed and ranges from 2 to 12 inches in thickness, from clay loam to clay in texture, and from moderate to strong subangular blocky, blocky, and granular in structure. Color ranges from brown to pale brown in hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 2 or 3.

The C horizon ranges from 0 to 20 inches in thickness. Color ranges from light yellowish brown to light gray in hue of 10YR to 2.5Y, value of 5 to 7, and chroma of 2 to 4. This horizon consists of calcareous marls and clays interbedded with limestone. The underlying thinly bedded limestone layer occurs at a depth of 30 to 40 inches.

Denton silty clay, 1 to 3 percent slopes (DeB).—This gently sloping soil is on mixed convex and open concave areas of the uplands. Soil areas are irregular and mainly less than 80 acres in size.

Included with this soil in some mapped areas are small areas of shallow Purves soils. Also included are small, narrow areas of Bolar clay loam. These inclusions make up less than 10 percent of any area of this soil. In some areas, the underlying limestone is more than 6 feet from the surface.

Most areas of this Denton silty clay are cultivated; some areas are in native grass pasture. (Capability unit IIe-1; Deep Upland range site)

Duffau Series

The Duffau series consists of deep, nearly level to sloping, loamy and sandy soils (fig. 8). These soils occupy erosional uplands and stream terraces.

In a representative profile, the 4 inch surface layer is dark grayish-brown mildly alkaline fine sandy loam. The subsurface layer is pale-brown, neutral fine sandy loam. The next layer, to a depth of 70 inches, is yellowish-red sandy clay loam. It is slightly acid in the upper part and neutral in the lower part. Below a depth of 70 inches is reddish-yellow neutral sandy clay loam.

Many of the gently sloping Duffau soils are cultivated. The steeper areas are used for pasture. These soils are well drained, are moderately permeable, and have a high available water capacity.

Representative profile of Duffau fine sandy loam, 3 to 5 percent slopes, in woods 100 yards east of a county road,

Figure 8.—**Profile of Duffau fine sandy loam.**

from a point on the county road 0.8 mile north from its intersection with Farm Road 219, which is 4 miles northeast of the junction of Farm Roads 219 and 8 in Lingleville, Tex.

A1—0 to 4 inches, dark grayish-brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, very fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; mildly alkaline; clear, smooth boundary.

A2—4 to 10 inches, pale-brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) when moist; weak, fine, granular structure; slightly hard when dry, friable when moist; neutral; clear, smooth boundary.

B21t—10 to 40 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; moderate, fine, subangular blocky structure; hard when dry, firm when moist; slightly acid; patchy clay films on peds and bridging sand grains; gradual, wavy boundary.

B22t—40 to 54 inches, yellowish-red (5YR 4/6) sandy clay loam, yellowish red (5YR 4/6) when moist; weak, coarse, subangular blocky structure; hard when dry, firm when moist; clay films bridge sand grains; neutral; gradual, wavy boundary.

B23t—54 to 70 inches, yellowish-red (5YR 5/6) sandy clay loam, yellowish red (5YR 4/6) when moist; few spots and streaks of strong brown (7.5YR 5/6); weak, coarse, subangular blocky structure; hard when dry, friable when moist; neutral; gradual, wavy boundary.

C—70 to 82 inches, reddish-yellow (7.5YR 6/6) sandy clay loam, strong brown (7.5YR 5/6) when moist; few, fine, faint yellowish-red mottles; massive; hard when dry, friable when moist; neutral.

The A horizon ranges from 6 to 14 inches in thickness and from sandy clay loam to loamy fine sand in texture. The color of the A1 horizon ranges from dark grayish brown to pale brown in hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. The A2 horizon is one or two units of value lighter in color than the A1 horizon.

The B2t horizon ranges from 50 to 70 inches in thickness, from sandy clay loam to clay loam in texture, and from mildly alkaline to slightly acid in reaction. Color ranges from red to reddish brown in hue of 2.5YR to 5YR, value of 3 to 6, and chroma of 4 to 8. The solum is 60 to 80 inches thick.

The C horizon ranges from reddish-yellow sandy clay loam to white packsand. The packsand is hard to very hard when dry but very friable to loose when wet. The material ranges from neutral to moderately alkaline and is calcareous in some places.

Duffau fine sandy loam, 0 to 1 percent slopes (DfA).—This loamy nearly level soil lies on terrace benches along streams. Most areas are long ovals 10 to 20 acres in size. A few areas are more than 100 acres in size.

The surface layer is pale-brown neutral fine sandy loam about 12 inches thick. The lower layers are yellowish-red slightly acid sandy clay loam. Below a depth of 60 inches, the underlying material is reddish-yellow fine sandy loam.

Included with this soil in mapping are small areas of Waurika fine sandy loam and Windthorst fine sandy loam. These areas are usually less than 2 acres in size and make up less than 5 percent of the acreage of this soil.

Most areas of this Duffau fine sandy loam, 0 to 1 percent slopes, are in cultivation. (Capability unit I–2; Sandy Loam range site)

Duffau fine sandy loam, 1 to 3 percent slopes (DfB).—This gently sloping soil occupies stream terraces and other upland areas. Soil areas are irregular and mostly less than 40 acres in size.

The surface layer is a brown to light-brown, neutral to medium acid fine sandy loam about 10 inches thick. The lower layers are yellowish-red sandy clay loam. Below a depth of 60 inches is yellowish-red mildly alkaline sandy clay loam.

Included in mapped areas of this soil are a few small areas of May fine sandy loam, Waurika fine sandy loam, and Duffau loamy fine sand, 0 to 5 percent slopes. Also included are minor areas of a soil like Duffau, but the lower layer extends to a depth of about 40 inches and is underlain by sandstone. These inclusions amount to less than 10 percent of the acreage of this soil.

Most areas of this Duffau fine sandy loam, 1 to 3 percent slopes, have been cleared of their native cover and are cultivated. Many areas also are used for pasture. (Capability unit IIe–3; Sandy Loam range site)

Duffau fine sandy loam, 3 to 5 percent slopes (DfC).—This soil is on dissected uplands. Areas are mainly irregular and less than 60 acres in size.

This soil has the profile described as representative for the Duffau series.

Included with some mapped areas of this soil are small areas, less than 5 acres in size, of Windthorst fine sandy loam, and small eroded areas of Duffau soils. Also included are minor areas of a soil like Duffau, except the lower layer extends to a depth of about 40 inches and is underlain by sandstone. These inclusions amount to less than 10 percent of any mapped area of this soil.

Most areas of this Duffau fine sandy loam, 3 to 5 percent slopes, are in native grass pasture. These areas are suitable for cultivation, but careful management is required to control erosion. (Capability unit IIIe–2; Sandy Loam range site)

Duffau loamy fine sand, 0 to 5 percent slopes (DlC).—This gently undulating soil lies on uplands in irregular areas mostly less than 60 acres in size.

The pale-brown loamy fine sand surface layer is 8 to 14 inches thick. The lower layers are red slightly acid sandy clay loam. Below a depth of 60 inches is reddish-yellow sandy clay loam.

Included in some mapped areas of this soil are areas of Chaney loamy sand, 1 to 5 percent slopes, Windthorst fine sandy loam, and Duffau fine sandy loam. These inclusions are less than 5 acres in size, and they account for less than 10 percent of the total acreage of this soil.

Most areas of this Duffau loamy fine sand, 0 to 5 percent slopes, are cultivated. (Capability unit IIIe–3; Sandy range site)

Duffau soils, 2 to 5 percent slopes, eroded (DuC2).—These gently sloping eroded soils occupy stream terraces and other uplands. They are in irregular areas mainly less than 40 acres in size. Many areas have shallow gullies 75 to 100 feet apart and several inches deep, and a few gullies several feet deep.

The surface layer ranges from a reddish sandy clay loam to a pale-brown loamy fine sand and is about 5 inches thick. Plowing has mixed the surface layer and the next lower layer. Below the surface layer is a dark-red to yellowish-red sandy clay loam. Below a depth of 60 inches is alkaline to neutral, interbedded sandy clay, some of which is calcareous.

Included in some mapped areas of these soils are small areas, less than 5 acres, of Windthorst fine sandy loam and May fine sandy loam. Also included are small areas of a soil like Duffau, except the lower layer extends to a depth of about 40 inches and is underlain by sandstone. These inclusions amount to less than 10 percent of the acreage of these soils.

Some areas of these Duffau soils, 2 to 5 percent slopes, eroded, are cultivated. Other old fields have been seeded to grass. These soils are susceptible to water erosion. (Capability unit IIIe–2; Sandy Loam range site)

Duffau soils, 5 to 8 percent slopes (DuD).—These rolling soils lie on uplands in irregular areas mainly less than 60 acres in size.

The surface layer is about 8 inches thick and ranges from sandy clay loam to fine sandy loam. In cultivated areas, the upper part of the next lower layer has been mixed with the surface layer. Beneath the surface layer is a yellowish-red, slightly acid, friable sandy clay loam. Below a depth of 60 inches is yellowish-red and brown mottled sandy clay loam.

Included with these soils in mapping are small areas, less than 5 acres, of Windthorst fine sandy loam. Also included are small areas of Duffau soils that are severely eroded. These inclusions make up less than 5 percent of the total acreage.

A few areas of these Duffau soils have been farmed in the past, but most areas are now in native grass. These soils are best suited to grass. (Capability unit IVe–4; Sandy Loam range site)

Duffau soils, 2 to 8 percent slopes, severely eroded (DuD3).—These gently sloping to sloping soils are on uplands. Gullies commonly dissect the area at intervals of 50 to 100 feet. These gullies are 3 to 15 feet deep and have vertical sides.

The surface layer is about 2 inches thick and ranges from fine sandy loam to sandy clay loam. The next layer is reddish sandy clay loam that becomes sandier with depth. Below a depth of 60 inches, the underlying material is made up of alkaline, reddish-yellow and brown fine sands that contain lenses of red clay.

Included in mapped areas of these soils are small areas of Gullied land and Windthorst and Duffau soils that are moderately eroded. Also included are small areas of a soil like the Duffau, except the lower layer extends to a depth of about 40 inches and is underlain by sandstone. These inclusions make up less than 15 percent of any area of these soils.

These Duffau soils are mostly in pasture. They are too eroded for cropland and are best suited to grass. Gullies have cut through the lower layers and exposed the unstable material below. These soils are critical sources of silt. Erosion is still active in the underlying material, and the areas are difficult to stabilize. Filling in, smoothing, and sodding help to reclaim these areas. (Capability unit VIe–2; Sandy Loam range site)

Dugout Series

The Dugout series consists of shallow, calcareous, loamy soils that rest on hard limestone. These gently sloping to sloping soils occupy banded areas throughout most of the county. Dugout soils are mapped only as a component of the Brackett-Dugout complex and the Purves-Dugout complex mapping units.

In a representative profile, the surface layer is a light brownish-gray calcareous gravelly clay loam about 8 inches thick. Below the surface layer, to a depth of 18 inches, is a very pale brown calcareous clay loam that contains common fine limestone fragments. Below a depth of 18 inches is interbedded limestone and calcareous marl.

The Dugout soils are used for native range. They are well drained, have moderately slow permeability, and have a low available water capacity.

Representative profile of Dugout gravelly clay loam, in an area of Purves-Dugout complex, in a pasture 35 feet south of private ranch road, from a point 0.7 mile east of the entrance to Dugout Ranch. This entrance is 2.9 miles north-northeast on Farm Road 1189 from its intersection with Farm Road 1188, which is 3 miles east of Morgan Mill, Tex.

A1—0 to 8 inches, light brownish-gray (10YR 6/2) gravelly clay loam, dark grayish brown (10YR 4/2) when moist; strong, fine, granular structure; hard when dry, friable when moist; 25 percent by volume limestone fragments; calcareous; moderately alkaline; clear, smooth boundary.

B2—8 to 18 inches, very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) when moist; strong, fine, granular structure; hard when dry, firm when moist; common, fine limestone fragments and soft masses of calcium carbonate; common threads and films of calcium carbonate; calcareous; moderately alkaline; abrupt, smooth boundary.

R—18 to 20 inches, indurated limestone bedrock that has rigid rock fabric.

Gravelly, cobbly, and stony phases of this soil are common. The volume of fragments generally ranges from 5 to 35 percent. The color of the A horizon ranges from dark grayish brown to light brownish gray in hue of 10YR to 2.5Y, value of 4 to 6, and chroma of 2. The B2 horizon ranges from loam to clay loam or silty clay loam in texture. Clay content ranges from about 20 to 35 percent. Color is very pale brown to light yellowish brown in hue of 10YR to 2.5Y, value of 5 to 7, and chroma of 2 to 4. Concretions and soft masses of calcium carbonate are common to many. The depth of the solum ranges from 10 to 20 inches. The R layer is strongly to very strongly cemented shell conglomerate to indurated white limestone. The limestone is finely fractured, but the rock is so rigid that most roots are restricted and digging is difficult. The underlying material, below a depth of 2 or 3 feet, is interbedded limestone and marl.

Exray Series

The Exray series consists of shallow fine sandy loams that have clay lower layers. These soils are gently sloping to sloping and occupy ridgetops. In this county, the Exray soils are mapped only in the Bonti-Exray stony fine sandy loams mapping unit.

In a representative profile, the surface layer is brown, neutral to slightly acid fine sandy loam about 8 inches thick. It contains few, fine, siliceous pebbles. Below the surface layer is a dark-red, medium acid clay about 8 inches thick that rests abruptly on the underlying sandstone bedrock.

Most areas of Exray soils are used for native grass pasture. These soils are well drained, have moderately slow permeability, and have a low available water capacity.

Representative profile of Exray fine sandy loam, in an area of Bonti-Exray stony fine sandy loams, in woods 50 feet south of a county road, from a point 0.1 mile east of the intersection of the county road and Texas Highway 108. This intersection is approximately 17 miles north-northwest on Texas Highway 108 from the Erath County courthouse in Stephenville, Tex.

A1—0 to 3 inches, brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) when moist; massive but porous; hard when dry, friable when moist; few, fine, siliceous pebbles; neutral; clear, smooth boundary.

A2—3 to 8 inches, brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) when moist; massive but porous; hard when dry, friable when moist; few, fine, siliceous pebbles; slightly acid; clear, smooth boundary.

B2t—8 to 16 inches, dark-red (2.5YR 3/6) clay, dark red (2.5YR 3/6) when moist; moderate and strong, very fine, blocky structure; very hard when dry, firm when moist; continuous clay films on peds; few sandstone fragments from 2 to 6 inches in diameter; medium acid; abrupt, smooth boundary.

R—16 to 24 inches, brownish-yellow strongly cemented sandstone. The upper 4 inches is fractured and contains about 10 percent dark-red clay in the crevices.

The A horizon is mainly fine sandy loam, but stony phases rare common. The A1 horizon ranges from neutral to slightly acid in reaction. Color ranges from very dark grayish brown to yellowish brown in hue of 10YR, value of 3 to 5, and chroma of 2 to 4. Fine siliceous pebbles range from none to 10 percent by volume. In some places sandstone fragments from 2 to 18 inches in diameter occur on the surface and scattered throughout the profile. The A2 horizon is 3 to 8 inches thick and brown to very pale brown in hue of 7.5YR or 10YR.

The B2t horizon ranges from medium acid to slightly acid in reaction and from clay loam to clay or sandy clay in texture. Color ranges from dark red to reddish brown in hue of 2.5YR, moist value less than 4, and dry value no more than 1 unit higher than moist value. The solum is 8 to 20 inches thick over sandstone bedrock.

Frio Series

The Frio series consists of deep calcareous soils of the bottom lands. These nearly level soils are on the flood plains of major streams and are occasionally flooded.

In a representative profile, the surface layer is a very dark grayish-brown, calcareous clay loam about 30 inches thick. Below the surface layer, to a depth of 40 inches, is brown calcareous clay loam. Below a depth of 40 inches is dark grayish-brown and grayish-brown, calcareous silty clay and silty clay loam.

Most areas of Frio soils are cultivated. A few areas are in pecan trees and pasture. These soils are well drained, have moderately slow permeability, and have a high available water capacity.

Representative profile of Frio clay loam, occasionally flooded, in a field 0.2 mile east of a county road, from a point 0.9 mile northwest of the intersection of the county road and Texas Highway 6. This intersection is in the west edge of Clairette, Tex.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) clay loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; slightly hard when dry, friable when moist; calcareous; moderately alkaline; clear, smooth boundary.

A12—6 to 30 inches, very dark grayish-brown (10YR 3/1.5) clay loam, very dark brown (10YR 2/1.5) when moist; strong, fine, subangular blocky structure; slightly hard when dry, friable when moist; calcareous; moderately alkaline; gradual, smooth boundary.

B2—30 to 40 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) when moist; moderate, fine, granular structure; slightly hard when dry, friable when moist; calcareous; moderately alkaline; gradual, smooth boundary.

Ab—40 to 56 inches, dark grayish-brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; slightly hard when dry, friable when moist; films and threads of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—56 to 65 inches, grayish-brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist; films and threads of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 20 to 50 inches in thickness, from grayish brown to very dark grayish brown in color, and from weak, fine, granular structure in the plow layer to strong, fine, subangular blocky structure in undisturbed areas.

The B horizon occurs between the depths of 20 and 50 inches where present but is absent in some profiles. The texture between depths of 10 and 40 inches ranges from 35 to 50 percent clay, and less than 40 percent is noncarbonate clay. Structure ranges from weak, very fine, subangular blocky to strong, fine, granular. Films and threads of calcium carbonate are common.

The C horizon ranges from clay loam to silty clay in texture and from light gray to dark grayish brown in color. Soft calcium carbonate masses or thin strata of limestone pebbles are common. Below a depth of 40 inches, buried horizons that are similar to the Frio soils on the surface are common.

Frio clay loam, occasionally flooded (Fr).—This nearly level soil consists of bands 10 to several hundred acres in size along flood plains.

Included with mapped areas of this soil are small areas that have a 4 to 10 inch sandy overwash. Also included are areas that seldom, if ever, flood and a few areas near the stream channel that flood frequently. Another inclusion is small areas of Bosque loam, occasionally flooded. These inclusions make up less than 10 percent of any area of this soil.

Most areas of this Frio clay loam are cultivated. This soil is in a favorable position to catch and hold water. Floods occur once in 4 to 10 years but do not limit use for crops. Most floods come early in spring before crops are planted. (Capability unit I–1; Bottomland range site)

Gowen Series

The Gowen series consists of deep, neutral, loamy soils on bottom lands. These nearly level soils are on flood plains along streams that drain mixed sandy uplands and clayey prairies. They flood occasionally.

In a representative profile, the surface layer is dark grayish-brown neutral clay loam about 15 inches thick. Below the surface layer, to a depth of 60 inches, is brown to dark grayish-brown neutral clay loam.

Most areas of Gowen soils are cultivated. These soils are well drained, have moderate permeability, and have a high available water capacity.

Representative profile of Gowen clay loam, occasionally flooded, in a field 100 feet east of a county road, from a point 0.2 mile south and 1.6 miles east on the county road from its intersection with Texas Highway 108. This intersection is 21 miles northwest of the Erath County courthouse in Stephenville, Tex.

A11—0 to 15 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, granular structure; very hard when dry, firm when moist; thin strata of lighter colored clay loam; neutral; clear, smooth boundary.

A12—15 to 30 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure; very hard when dry, firm when moist; porous; neutral; clear, smooth boundary.

C—30 to 60 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; structureless; porous; very hard when dry, firm when moist; thin strata of pale-brown fine sandy loam and grayish-brown clay; neutral; gradual boundary.

The A1 horizons range from 24 to 40 inches in thickness, from brown to very dark grayish brown in color, and from neutral to mildly alkaline in reaction. The C horizon ranges from light to dark in an alternating order that follows no particular sequence. Color is light yellowish brown or light gray to very dark grayish brown in hue of 10YR or 2.5Y. The C horizon is clay loam to clay that contains thin strata of loam. Reaction ranges from neutral to moderately alkaline and calcareous in the lower part.

Gowen clay loam, occasionally flooded (Go).—This nearly level soil occupies bands 10 to 200 acres in size along the flood plains of major streams.

Included with this soil in mapping are a few areas that have clay surface layers. A few areas along stream channels are frequently flooded. These inclusions make up less than 10 percent of any mapped area of this soil.

Most areas of this Gowen clay loam, occasionally flooded, are cultivated. Floods occur once in 4 to 10 years but generally come early in spring before crops are planted. (Capability unit I–1; Bottomland range site)

Gullied Land

Gullied land (Gu) consists of areas in which 50 to 80 percent of the soil has been destroyed by deep gullies (fig. 9). The exposed soil material is reddish sandy clay. Small patches of Windthorst and Duffau soils remain between the gullies. The gullies are U-shaped and have cut into the unstable sandy substrata. They are 2 to 10 feet deep and 10 to 40 feet wide. The gully walls are devoid of vegetation, and many are actively eroding.

Included with this unit in mapping are areas of severely eroded Selden soils.

This mapping unit is not accessible to machinery and not suitable for either crops or pasture without extensive reclamation. It is a source of sediments that damage soils below. The areas are suitable for very limited grazing. (Capability unit VIIe–1; included in surrounding range site)

Hensley Series

The Hensley series consists of loamy soils that are shallow over limestone. These nearly level to gently sloping soils occupy convex ridgetops.

In a representative profile, the surface layer is brown neutral loam about 5 inches thick. The reddish-brown mildly alkaline clay lower layer rests on limestone at a depth of 16 inches.

Most of the Hensley soils are used for native range. They are well drained, are slowly permeable, and have a low available water capacity.

Representative profile of Hensley loam, 1 to 3 percent slopes, in a pasture 200 feet east of Farm Road 914, from a point 0.2 mile south of the intersection of Farm Road 914 and Loop 195 in the southern part of Stephenville, Tex.

A1—0 to 5 inches, brown (10YR 4/3) loam, dark brown (10YR 3/3) when moist; moderate, medium, blocky structure parting to moderate, very fine, subangular blocky structure; hard when dry, friable when moist; neutral; clear, smooth boundary.

B2t—5 to 16 inches, reddish-brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) when moist; strong, fine, blocky structure; very hard when dry, very firm when moist; continuous clay films; mildly alkaline; abrupt, smooth boundary.

R—16 inches, indurated limestone.

The A1 horizon ranges from 4 to 6 inches in thickness and from loam to clay loam in texture. Color ranges from brown to reddish brown in hue of 5YR to 10YR, value of 3 to 5, and chroma of 2 to 4. The B2t horizon is 8 to 14 inches thick, clay loam to clay, and reddish brown to dark reddish brown in hue of 2.5YR, value of 3 or 4, and chroma of 2 to 4. The solum is 12 to 20 inches thick over indurated limestone.

Figure 9.—**View of Gullied land shows destructive force of water erosion on unprotected soil.**

Hensley loam, 1 to 3 percent slopes (HeB).—This gently sloping soil occupies hilltops that are oval to irregular and mostly less than 40 acres in size.

This soil has the profile described as representative for the Hensley series.

Included in mapped areas of this soil are small areas of Lindy loam, 1 to 3 percent slopes, and Hensley stony loam. These inclusions make up less than 15 percent of the acreage of this soil.

Most areas of this Hensley loam, 1 to 3 percent slopes, are in native range. (Capability unit IIIe-5; Redland range site)

Hensley stony loam (Hn).—This nearly level to gently sloping stony soil is on hilltops in areas 30 to 200 acres in size. It has slopes of 0 to 4 percent, and from 2 to 40 percent of the surface is covered with hard limestone fragments 1 to 4 feet in diameter.

The surface layer is reddish-brown stony clay loam about 5 inches thick. The next layer is dark reddish-brown clay. The underlying material, below a depth of 16 inches, is hard limestone.

Included with this soil in mapping are small areas of Crawford clay, 1 to 3 percent slopes, Hensley loam, 1 to 3 percent slopes, and Lindy loam, 1 to 3 percent slopes. Also included are small areas of a soil similar to Hensley, but it has a clay surface layer. These included areas make up less than 15 percent of any mapped area of this soil.

This Hensley stony loam is in native range. (Capability unit VIs-1; Redland range site)

Houston Black Series

The Houston Black series consists of deep calcareous clays. These nearly level to gently sloping soils occupy valleys (fig. 10). Undisturbed areas have a pronounced microrelief that consists of alternating basins and microknolls.

In a representative profile, the surface layer is a very dark gray calcareous clay about 30 inches thick. Below the surface layer, to a depth of 38 inches, is a dark grayish-brown calcareous clay. The underlying material is light-gray calcareous clay that has a few, distinct, yellow mottles.

Most areas of Houston Black soils are cultivated. Water intake is rapid when the soil is dry and cracked, but the soil becomes very slowly permeable when wet. Available water capacity is high.

Representative profile of Houston Black clay, in a field 40 yards northeast of a county road, from a point 0.55 mile northeast and 370 feet southeast of an intersection of two county roads. This intersection is 0.1 mile southwest and 1.7 miles southeast from the intersection of the county road and U.S. Highway 67, and 6.4 miles southeast of the Erath County courthouse in Stephenville, Tex., on U.S. Highway 67.

Ap—0 to 4 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; strong, fine, granular structure; very hard when dry, very firm when moist; calcareous; moderately alkaline; abrupt, smooth boundary.

Figure 10.—**Terraced field of Houston Black clay, 1 to 3 percent slopes.**

A12—4 to 30 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; coarse blocky structure parting to strong, very fine, blocky structure; common, grooved, intersecting slickensides; very hard when dry, very firm when moist; calcareous; moderately alkaline; gradual, wavy boundary.

AC1—30 to 38 inches, dark grayish-brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) when moist; coarse blocky structure parting to very fine blocky structure; common intersecting slickensides; very hard when dry, very firm when moist; calcareous; moderately alkaline; clear, wavy boundary.

AC2—38 to 66 inches light-gray (10YR 7/2) clay; few, fine, distinct, yellow (10YR 7/8) mottles; weak, coarse, blocky structure; very hard when dry, very firm when moist; calcareous; moderately alkaline.

The A horizon ranges from 14 to 40 inches in thickness. Color ranges from black to very dark gray in hue of 10YR, value of 2 or 3, and chroma of 1 to 1.4. The structure ranges in grade from weak to strong, in size from fine to very fine, and in form from granular to irregular blocky. Slickensides are common in the lower part of the A horizon.

The AC1 horizon ranges from 6 to 38 inches in thickness. Color ranges from very dark grayish brown to light brownish gray in hue of 2.5Y or 10YR, value of 2 to 6, and chroma of 1 or 2. Depth to the AC2 horizon is from 26 to 68 inches. This horizon is very pale brown to dark yellowish brown in hue of 2.5Y or 10YR, value of 4 to 8, and chroma of 2 to 4. This horizon is clay to clayey marl.

Houston Black clay, 0 to 1 percent slopes (HoA).—This nearly level soil occupies long narrow areas in smooth shallow valleys.

The surface layer is a very dark gray, moderately alkaline, firm clay. The next layer is a grayish-brown, blocky, moderately alkaline clay. Below a depth of 50 inches, the underlying material is a white, alkaline, clayey marl.

Included with this soil in mapping are small areas of Denton silty clay, 1 to 3 percent slopes, and Purves clay. These inclusions make up less than 5 percent of the acreage of this soil.

Most areas of this Houston Black clay, 0 to 1 percent slopes, are cultivated. (Capability unit IIs–1; Deep Upland range site)

Houston Black clay, 1 to 3 percent slopes (HoB).—This gently sloping soil occupies smooth valleys. It is the most extensive soil mapped in the Houston Black series.

This soil has the profile described as representative for the Houston Black series.

Included in mapped areas of this soil are small areas of Denton silty clay, 1 to 3 percent slopes, and Purves clay. Also included are a few small limestone outcrops and a few areas that have moderate erosion. These inclusions make up less than 15 percent of any area of this soil. Most areas of this soil are underlain by clayey marls. Fringe areas transitional to Denton or Purves soils are underlain by limestone at a depth of 26 to 46 inches.

Most areas of this Houston Black clay, 1 to 3 percent slopes, are cultivated. (Capability unit IIe–2; Deep Upland range site)

Lamar Series

The Lamar series consists of moderately deep, calcareous, loamy soils. These gently sloping soils are on uplands throughout the county.

In a representative profile, the surface layer is a dark grayish-brown calcareous loam about 7 inches thick. Below the surface layer, to a depth of 27 inches, is a pale-brown to very pale brown calcareous clay loam that contains common fragments of sandy limestone. The underlying layers are yellowish limy silty clay loam and grayish-brown, light-gray, yellow, and yellowish-brown marl of clay loam texture.

Some areas of Lamar soils are cultivated, while other areas are used for native range. These soils are well drained, are moderately permeable, and have a high available water capacity.

Representative profile of Lamar loam, 3 to 5 percent slopes, in a pasture 90 yards west of a county road, from a point 3.3 miles northwest of the intersection of the county road and Farm Road 2156. This intersection is 1.2 miles west of the junction of Farm Road 219 and Farm Road 2156, which is about 2 miles northwest of Dublin, Tex.

A1—0 to 7 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; moderate, very fine, subangular blocky and granular structure; hard when dry, friable when moist; calcareous; moderately alkaline; clear, smooth boundary.

B21—7 to 18 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 4/3) when moist; moderate, very fine, subangular blocky and granular structure; common flagstones at lower boundary; hard when dry, slightly firm when moist; calcareous; moderately alkaline; clear, smooth boundary.

B22—18 to 27 inches, very pale brown (10YR 7/4) clay loam, light yellowish brown (10YR 5.5/4) when moist; moderate, very fine, subangular blocky and granular structure; contains 20 percent slightly hard fragments of sandy limestone; calcareous; moderately alkaline; clear, smooth boundary.

Cca—27 to 36 inches, yellow (2.5Y 7/6) silty clay loam; white masses of soft calcium carbonate; calcareous; moderately alkaline; clear, smooth boundary.

C2—36 to 40 inches, grayish-brown, light-gray, and yellowish-brown marl of clay loam texture; distinct bedding planes; 2 percent soft calcium carbonate concretions; calcareous; moderately alkaline.

The A horizon ranges from 4 to 10 inches in thickness and from neutral to moderately alkaline in reaction. Color ranges from dark grayish brown to pale brown in hue of 10YR, value of 4 to 6, and chroma of 2 or 3. The B2 horizons are 10 to 40 inches thick, loam to clay loam, and grayish brown to pale yellow in hue of 10YR to 2.5Y, value of 5 to 7, and chroma of 2 to 6. Most areas contain limestone fragments.

The Cca horizon is 20 to 40 inches below the surface and is yellowish-brown to olive-brown and yellow, calcareous marl. Both limestone fragments and soft masses of calcium carbonate are common. The C2 horizon is weakly cemented sandy limestone and hard limestone to limy sandstone and marl.

Lamar loam, 1 to 3 percent slopes (LaB).—This gently sloping soil occupies hilltops in areas mostly less than 20 acres in size.

The surface layer is a brown alkaline loam about 6 inches thick. The next layer is a pale-brown to pale-yellow alkaline clay loam. Below a depth of 26 inches, the underlying material is a yellowish-brown sandy marl that becomes interbedded with sandy limestone.

Included with this soil in mapping are some gravelly and stony areas. These areas are indicated by appropriate symbols on the maps at the back of this survey.

About half of the acreage of this Lamar loam, 1 to 3 percent slopes, is in cultivation. It is farmed within larger areas of Duffau and Windthorst soils. (Capability unit IIIe–1; Rolling Prairie range site)

Lamar loam, 3 to 5 percent slopes (LaC).—This gently sloping soil occupies convex hilltops and hillsides in irregular areas about 20 acres in size.

This soil has the profile described as representative for the Lamar series.

Included with this soil in mapping are areas of gravel and limestone outcrops. These areas are indicated by symbols on the soil maps at the back of this survey.

Nearly all of this Lamar loam, 3 to 5 percent slopes, is in native range. (Capability unit IVe–1; Rolling Prairie range site)

Lewisville Series

The Lewisville series consists of deep, gently sloping to sloping, calcareous soils. These soils occupy stream terraces and foot slopes below limestone hills.

In a representative profile, the surface layer is a dark grayish-brown calcareous clay loam about 16 inches thick. Below the surface layer, to a depth of 42 inches, is a grayish-brown calcareous clay loam. The underlying material is pale-brown calcareous clay loam that contains many small limestone fragments (fig. 11).

Many areas along the stream terraces are cultivated; however, most of the more sloping areas below limestone hills are in native range. These soils are well drained, have moderate permeability, and have a high available water capacity.

Representative profile of Lewisville clay loam, 1 to 3 percent slopes, in a cultivated field 0.75 mile west of Farm Road 3106, from a point 4.5 miles south of the intersection of Farm Road 3106 and U.S. Highway 377 in Bluff Dale, Tex.

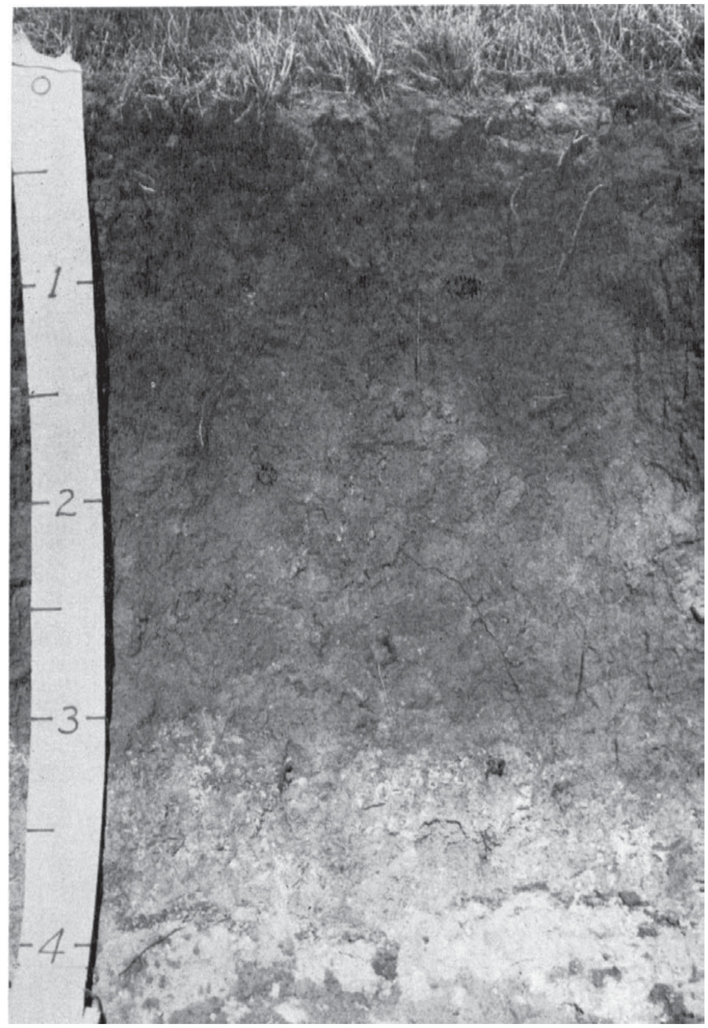


Figure 11.—**Profile of Lewisville clay loam.**

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular to subangular blocky structure; hard when dry, friable when moist; calcareous; moderately alkaline; abrupt, smooth boundary.

A1—6 to 16 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; hard when dry, friable when moist; calcareous; moderately alkaline; gradual, smooth boundary.

B21—16 to 24 inches, grayish-brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) when moist; moderate, fine, subangular blocky structure; hard when dry, friable when moist; few, fine limestone fragments; few calcium carbonate films and threads; calcareous; moderately alkaline; gradual, smooth boundary.

B22—24 to 42 inches, grayish-brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) when moist; moderate, fine, subangular blocky structure; hard when dry, friable when moist; common fine limestone fragments; common threads and films of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

C—42 to 60 inches, pale-brown (10YR 6/3) clay loam, brown (10YR 5/3) when moist; common to many, small limestone fragments; many threads and films of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 8 to 20 inches in thickness. Color ranges from brown to very dark grayish brown in hue of 10YR, value of 3 to 5, and chroma of 2 or 3. Structure ranges from moderate, fine, granular to moderate, fine, subangular blocky. The B2 horizons are 12 to 30 inches thick and have a clay loam to clay texture. Clay content of these horizons is 35 to 50 percent. Color is brown to pale brown in hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. They have moderate, fine, granular structure to moderate, fine, subangular blocky structure. Small limestone fragments and calcium carbonate threads and films are few to common. The C horizon is stratified and gravelly in some areas.

Lewisville clay loam, 1 to 3 percent slopes (LeB).—This gently sloping soil occupies curved bands along major streams in areas mainly less than 50 acres in size.

This soil has the profile described as representative for the Lewisville series.

Included in mapped areas of this soil are small areas of Venus loam. These inclusions make up less than 15 percent of any area of this soil.

Most of this Lewisville clay loam, 1 to 3 percent slopes, is cultivated. (Capability unit IIe-1; Deep Upland range site)

Lewisville clay loam, 3 to 5 percent slopes (LeC).—This gently sloping soil is in bands along major streams and on foot slopes.

The surface layer is dark grayish-brown calcareous clay loam. The next layer, to a depth of 45 inches, is brown calcareous clay loam. The underlying material is pink calcareous clay loam that is 20 percent limestone gravel.

Included in mapped areas of this soil are small areas of Venus loam and Altoga clay loam. These inclusions comprise less than 10 percent of any mapped area of this soil.

Most of this Lewisville clay loam, 3 to 5 percent slopes, is in range. A few areas are cultivated. (Capability unit IIIe-1; Deep Upland range site)

Lewisville-Altoga clay loams, 3 to 5 percent slopes, eroded (LgC2).—This mapping unit is made up of eroded soils that occupy convex foot slopes and stream terraces. The soils occur in mixed irregular patterns. Mapped areas contain about 55 percent Lewisville clay loam, 35 percent Altoga clay loam, and 10 percent Lamar and Venus soils. Erosion on these soils ranges from slight to severe.

The Lewisville soil has a surface layer of grayish-brown to dark grayish-brown calcareous clay loam about 12 inches thick. Below this layer is brown to grayish-brown calcareous clay loam. Below a depth of 40 inches is calcareous clay loam.

The Altoga soil has a surface layer of light brownish-gray calcareous clay loam about 6 inches thick. Below this layer is pale-brown to very pale brown, granular, calcareous clay loam.

Most areas of these Lewisville-Altoga clay loams are in native range. They are best suited to grass, but some crops are grown. Erosion is a severe hazard when these soils are cultivated. (Capability unit IIIe-1; Deep Upland range site)

Lindy Series

The Lindy series consists of slightly acid loamy soils that are moderately deep over limestone. These gently sloping soils occupy ridgetops.

In a representative profile, the surface layer is brown slightly acid loam. Below this layer is reddish-brown, slightly acid, firm clay that rests on hard limestone at a depth of 28 inches.

Most areas of Lindy soils are used for native range, but some areas are cultivated. These soils are well drained, are slowly permeable, and have a moderate available water capacity.

Representative profile of Lindy loam, 1 to 3 percent slopes, in a pasture behind a farm house, 0.2 mile west of Farm Road 914, from a point 1.1 miles south of the junction of Farm Road 914 and Loop 195 in the south part of Stephenville, Tex.

A1—0 to 8 inches, brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) when moist; weak, fine, subangular blocky and granular structure; hard when dry, friable when moist; slightly acid; clear, smooth boundary.

B21t—8 to 18 inches, reddish-brown (2.5YR 4/4) clay, dark reddish brown (2.5YR 3/4) when moist; moderate, very fine, blocky structure; very hard when dry, firm when moist; distinct clay films; few very fine ferromanganese concretions; slightly acid; gradual, wavy boundary.

B22t—18 to 28 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) when moist; moderate, very fine, blocky structure; very hard when dry, firm when moist; distinct clay films; few very fine ferromanganese concretions; slightly acid; abrupt, wavy boundary.

IIR—28 to 30 inches, brownish, fractured, indurated limestone bedrock.

The A horizon ranges from 5 to 12 inches in thickness, from fine sandy loam to loam in texture, and from slightly acid to neutral in reaction. Color ranges from yellowish brown to dark grayish brown in hue of 5YR to 10YR, value of 3 to 5.5, and chroma of 2 to 4. The Bt horizons are 15 to 28 inches thick, clay to clay loam, and yellowish red to dark reddish brown in hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 3 to 6. Structure is fine to very fine blocky. Depth to fractured limestone ranges from 20 to 40 inches; the average is about 28 inches. Some areas have a strong-brown to yellowish, marly, calcareous C horizon above the limestone.

Lindy fine sandy loam, 1 to 3 percent slopes (LnB).—This soil occupies oval to irregular hilltops in areas mainly 20 to 40 acres in size.

The surface layer is a yellowish-brown, slightly acid fine sandy loam about 8 inches thick. Below this layer is red, medium acid, firm clay. Below a depth of 38 inches is interbedded limestone and calcareous marl.

Nearly all of this Lindy fine sandy loam, 1 to 3 percent slopes, is cultivated. (Capability unit IIe-3; Sandy Loam range site)

Lindy fine sandy loam, 1 to 3 percent slopes, eroded (LnB2).—This gently sloping soil occupies small irregular areas on hilltops. Soil areas are marked by shallow gullies 50 to 150 feet apart.

Part of the original surface layer has been removed by erosion. The surface layer is reddish-brown fine sandy loam about 5 inches thick. Below this layer is reddish-brown firm clay. Below a depth of 25 inches, the underlying material is hard limestone and gravel.

Most areas of this Lindy fine sandy loam, 1 to 3 percent slopes, eroded, are cultivated. (Capability unit IIIe-2; Sandy Loam range site)

Lindy loam, 1 to 3 percent slopes (LyB).—This soil occupies small irregular areas on hilltops.

This soil has the profile described as representative for the Lindy series.

Included in mapped areas of this soil are small areas of shallow Hensley loam, 1 to 3 percent slopes, and Hensley stony loam.

Most of this Lindy loam, 1 to 3 percent slopes, is used for native range. A few areas are cultivated. (Capability unit IIe–1; Redland range site)

Maloterre Series

The Maloterre series consists of loamy to clayey, calcareous, very shallow soils underlain by limestone. These gently sloping to rolling soils occupy benched limestone ridges.

In a representative profile, the 8 inch surface layer is grayish-brown, calcareous clay loam that contains many fine shell and limestone fragments. Below a depth of 8 inches is shell-conglomerate limestone that has a rock fabric so rigid most plant roots cannot penetrate it.

Most areas of the Maloterre soils are used for native range. The soils are somewhat excessively drained, permeability is moderately slow, and the available water capacity is low.

Representative profile of Maloterre gravelly clay loam, in an area of Maloterre soils, in a pasture 60 feet north of U.S. Highway 67, from a point 0.1 mile northwest of the junction of U.S. Highway 67 and Texas Highway 220. This junction is 17 miles southeast of Stephenville, Tex.

A1—0 to 8 inches, grayish-brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) when moist; moderate, very fine, blocky and granular structure; hard when dry, firm when moist; 25 percent by volume fine shell and limestone fragments; few limestone fragments from 3 to 8 inches in diameter on the surface; calcareous; moderately alkaline; abrupt, wavy boundary.

R—8 to 10 inches, indurated shell-conglomerate limestone that has rigid rock fabric.

The A horizon ranges from 3 to 12 inches in thickness and from clay loam to clay in texture. Clay content of this horizon ranges from 35 to 50 percent. Gravelly, cobbly, and stony phases that are 5 to 35 percent fragments are common. The color of the A horizon ranges from dark grayish brown to pale brown in hue of 10YR, value of 4 to 6, and chroma of 1.5 to 3. The R layer is strongly to very strongly cemented shell conglomerate to indurated white limestone bedrock that restricts root penetration.

Maloterre soils (Mo).—These very shallow gravelly soils occupy ridgetops. They formed over beds of shell-conglomerate limestone. The soils range in slope from 1 to 8 percent but are dominantly 1 to 5 percent. Mapped areas of these soils contain about 72 percent Maloterre gravelly clay loam, 14 percent Purves clay, and 14 percent inclusions of Dugout and other soils. Some narrow bands that contain limestone fragments ranging from 3 inches to 2 feet in diameter are included.

The Maloterre soils in this unit have the profile described as representative for the series, but texture of the surface layer ranges from clay loam to clay.

Purves soils have a dark grayish-brown, calcareous clay surface layer about 10 inches thick. The surface layer rests abruptly on hard limestone.

These Maloterre soils are mostly in native range. They are too shallow and gravelly for cultivation and are best suited to range. The underlying shell-conglomerate limestone has been used as a source of road gravel in some areas. (Capability unit VIIs–1; Very Shallow range site)

May Series

The May series consists of brownish, neutral, loamy soils. These deep nearly level to gently sloping soils occupy open concave upland valleys and stream terraces. They formed in local loamy alluvium.

In a representative profile, the surface layer is grayish-brown neutral fine sandy loam about 16 inches thick. The next layer is dark-brown sandy clay loam 14 inches thick. Below this, to a depth of about 50 inches, is a yellowish-brown alkaline sandy clay loam. Below a depth of 50 inches is light yellowish-brown calcareous sandy clay loam.

Most areas of May soils are cultivated. These soils are well drained, are moderately permeable, and have a high available water capacity.

Representative profile of May fine sandy loam, 0 to 1 percent slopes, in a cultivated field 0.4 mile south of a county road, from a point on the county road 5.8 miles west of an intersection with a north-south county road. This intersection is 2.9 miles north-northwest on the county road from its junction with Texas Highway 108. This junction is 14 miles north of Stephenville, Tex., on Texas Highway 108, and 0.9 mile north of the Hannibal store.

Ap—0 to 5 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, very fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; neutral; abrupt, smooth boundary.

A1—5 to 16 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, very fine, subangular blocky and granular structure; slightly hard when dry, friable when moist; few, rounded, siliceous pebbles; neutral; clear, wavy boundary.

B21t—16 to 30 inches, dark-brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky structure; hard when dry, firm when moist; patchy clay films; mildly alkaline; gradual, wavy boundary.

B22t—30 to 42 inches, yellowish-brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) when moist; weak, fine, subangular blocky structure; hard when dry, firm when moist; patchy clay films; mildly alkaline; clear, wavy boundary.

B3t—42 to 50 inches, yellowish-brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) when moist; weak, very fine, subangular blocky structure; hard when dry, friable when moist; calcareous; moderately alkaline; gradual, wavy boundary.

C—50 to 60 inches, light yellowish-brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) when moist; hard when dry, friable when moist; common, fine, hard and soft calcium carbonate concretions; calcareous; moderately alkaline.

The A horizons range from 8 to 18 inches in thickness, from slightly acid to mildly alkaline in reaction, and from massive to subangular blocky and granular in structure. Color ranges from grayish brown to dark brown in hue of 7.5YR or 10YR, value of 4 to 5.5, and chroma of 2 to 4.

The B2t horizons range from 15 to 32 inches in thickness, from neutral to moderately alkaline in reaction, from moderate, medium, subangular blocky structure to weak blocky structure, and from sandy clay loam to clay loam in texture. Color ranges from dark brown to yellowish brown

in hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 6. Some pedons are calcareous below a depth of 2 feet.

The B3t horizon ranges from 2 to 8 inches in thickness, from neutral to moderately alkaline in reaction, and from sandy clay loam to clay loam in texture. Color is brown to brownish yellow in hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 2 to 8. Areas having faintly mottled lower layers are common.

The C horizon ranges from neutral, yellow and brown clay loam to very pale brown, moderately alkaline, calcareous loam. In some areas the lower part is stratified and contains rounded limestone pebbles.

May fine sandy loam, 0 to 1 percent slopes (MfA).—This nearly level soil occupies stream terrace benches or upland valleys. It is in long narrow areas 7 to 60 acres in size. These areas receive extra water and soil materials from slopes above.

This soil has the profile described as representative for the May series.

Included with this soil in mapping are narrow areas of Gowen clay loam, occasionally flooded, and Bunyan soils. In some areas where cultivation has depleted the organic matter, the plow layer is pale brown in color. Inclusions occupy less than 15 percent of any area of this soil.

Most of this May fine sandy loam, 0 to 1 percent slopes, is cultivated. (Capability unit I–2; Sandy Loam range site)

May fine sandy loam, 1 to 3 percent slopes (MfB).—This gently sloping soil occupies slightly concave foot slopes and terrace benches along major streams. It lies in long narrow bands 7 to 40 acres in size.

The surface layer is about 14 inches of brown, neutral fine sandy loam. The next layer is brown to brownish-yellow sandy clay loam. Below a depth of 46 inches is yellow, neutral sandy clay loam.

Included in mapped areas of this soil are small areas of Duffau fine sandy loam. In areas where cultivation has depleted the organic matter, the plow layer is pale brown in color.

Most of this May fine sandy loam, 1 to 3 percent slopes, is cultivated. Some areas are sodded in bermudagrass. (Capability unit IIe–3; Sandy Loam range site)

Mine Dumps

Mine dumps (Mn) have little or no agricultural value. They are piles of waste rock that came from coal mines in the northwestern part of the county. The areas support no vegetation. Materials washed from these areas damage soils below. Waste rock from some of these areas is used for road material.

Nimrod Series

The Nimrod series consists of deep sandy soils that have red, yellow, and gray mottled lower layers. These nearly level to sloping soils occupy erosional uplands.

In a representative profile, the 4 inch surface layer is neutral, grayish-brown fine sand. The subsurface layer, to a depth of 27 inches, is a very pale brown, slightly acid fine sand. The medium to strongly acid lower layers, to a depth of 68 inches, are sandy clay loam that is mottled in shades of yellow, gray, red, and brown.

Most areas of Nimrod soils are cultivated. Some areas are in wooded native grass pastures; other areas are in thick scrub-oak brush. These soils are moderately slowly permeable. For short periods following heavy rainfall, a perched water table occurs in the lower part of the subsurface layer. Available water capacity is moderate.

Representative profile of Nimrod fine sand, 0 to 5 percent slopes, in a woods 225 feet east of a farm lane, from a point on the lane 150 feet south of Farm Road 2303, which is 3.5 miles northwest of the junction of Farm Road 2303 and Texas Highway 108. This junction is 0.6 mile north of the intersection of Farm Road 8 and Texas Highway 108 in the northern part of Stephenville, Tex.

A1—0 to 4 inches, grayish-brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) when moist; structureless; loose when dry or moist; neutral; abrupt, irregular boundary.

A2—4 to 27 inches, very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) when moist; structureless; loose when dry or moist; slightly acid; abrupt, wavy boundary.

B21t—27 to 40 inches, coarsely mottled light-gray (10YR 7/2), reddish-yellow (7.5YR 6/6), and yellowish-brown (10YR 5/6) sandy clay loam; strong prismatic structure parting to coarse blocky structure; extremely hard when dry, very firm when moist; peds are coated with gray (10YR 5/1) fine sand; distinct clay films on vertical peds; strongly acid; gradual, wavy boundary.

B22t—40 to 53 inches, light-gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) when moist; distinct coarse mottles of olive brown (2.5Y 4/4) and red (2.5YR 4/6); strong, coarse, prismatic structure parting to weak blocky structure; extremely hard when dry, very firm when moist; distinct clay films and sandy coatings of gray on vertical ped faces; medium acid; gradual, wavy boundary.

B3—53 to 68 inches, light-gray (10YR 7/2) sandy clay loam, light brownish gray (10YR 6/2) when moist; fewer coarse, red and brownish mottles than in horizon above; strong, coarse, prismatic structure; extremely hard when dry, very firm when moist; ped surfaces coated with gray sand; medium acid; diffuse, wavy boundary.

C—68 to 80 inches, coarsely mottled red (2.5YR 5/6) and light-gray (10YR 7/2) sandy loam; structureless; very hard when dry, very firm when moist; slightly acid.

The fine sand A horizon ranges from 20 to 40 inches in thickness. The A1 horizon ranges from 2 to 6 inches in thickness and from mildly alkaline to neutral in reaction. Color ranges from very pale brown to grayish brown in hue of 10YR, value of 4 to 7, and chroma of 2 to 4. The A2 horizon is 18 to 34 inches thick, is medium acid to neutral, and is very pale brown to brown in hue of 10YR, value of 6 to 8, and chroma of 3 or 4. The lower boundary is clear to abrupt and is wavy.

The B2t horizons range from 20 to 40 inches in thickness and from strongly acid to medium acid in reaction. This horizon is colored in shades of yellow, brown, or red mottled with gray. The B3 and C horizons are yellowish-brown, red, and gray mottled sandy clay to reddish sand that contains lenses of gray sandy clay. Reaction is strongly acid to slightly acid.

Nimrod fine sand, 0 to 5 percent slopes (NdC).—This soil occupies sandy irregular upland areas that form an undulating landscape of mixed concave and convex surfaces. Low hummocky relief and fence-row sand accumulations are common where wind erosion has been active.

This soil has the profile described as representative for the Nimrod series.

Included in mapped areas of this soil are small areas of Selden fine sand, 1 to 5 percent slopes, that have a

fine sand surface layer 14 to 20 inches thick. Also included are small areas of Patilo fine sand, which have a surface layer that ranges from 40 to 72 inches thick. These inclusions make up less than 15 percent of any mapped area of this soil.

Most of this Nimrod fine sand, 0 to 5 percent slopes, is in cultivation. Intensive measures are needed in cultivated areas to control soil blowing. (Capability unit IIIe-4; Sandy range site)

Nimrod-Arenosa-Patilo fine sands, 0 to 3 percent slopes (NpB).—This mapping unit is made up of deep sandy soils on uplands. These soils form a timbered undulating landscape that has mixed concave and convex surfaces. They occur in mixed irregular patterns that make separation impractical.

A representative area of this mapping unit contains about 35 percent Nimrod fine sand; 25 percent Patilo fine sand; 25 percent Arenosa fine sand; and 15 percent inclusions of small areas of Selden and Windthorst soils.

The Nimrod soil has a poorly graded fine sand surface layer about 27 inches thick. Lower layers are red, yellow, and gray mottled, acid sandy clay loam that extends to a depth of more than 60 inches.

The Patilo soil has a slightly acid fine sand surface layer about 50 inches thick. Lower layers are mottled red, gray, and yellow, strongly acid sandy clay loam.

The Arenosa soil consists of neutral to medium acid, loose fine sand that extends to a depth of more than 72 inches. Selden and Windthorst soils have sandy surface layers less than 20 inches thick.

Some areas of this mapping unit have been cleared and cultivated in the past, but very few areas are now farmed. Most areas are covered by stands of scrub oak timber and are used for brushy range (fig. 12). These areas are best suited to grass. (Capability unit IVe-6; Deep Sandy range site)

Nimroad-Arenosa-Patilo fine sands, 3 to 8 percent slopes (NpD).—This mapping unit is made up of deep, sandy, sloping soils. These soils occur in mixed irregular patterns that make separation impractical.

A representative area of this mapping unit contains about 30 percent Nimrod fine sand; 30 percent Arenosa fine sand; 25 percent Patilo fine sand; and 15 percent inclusions of other soils, mostly small areas of Selden and Windthorst soils.

The Nimrod soil has a poorly graded fine sand surface layer about 27 inches thick. Lower layers are red, yellow, and gray mottled, acid sandy clay loam that extends more than 60 inches below the surface.

The Patilo soil has a poorly graded fine sand surface layer about 50 inches thick. Lower layers are red, yellow, and gray mottled sandy clay loam.

The Arenosa soil consists of neutral to medium acid, loose fine sand that extends to a depth of more than 72 inches. Selden and Windthorst soils have sandy surface layers less than 20 inches thick.

Figure 12.—**Thick cover of scrub oak brush typical of Nimrod-Arenosa-Patilo fine sands.**

Most areas of this mapping unit are covered with a moderate to thick stand of scrub oak timber. They are too sloping and sandy for cultivation and are best suited to grass. The soils are so loose that the operation of mechanical equipment on slopes is difficult. Overgrazing destroys the cover of vegetation and makes the areas subject to soil blowing. (Capability unit VIe-3; Deep Sandy range site)

Owens Series

The Owens series consists of calcareous clay soils that are shallow and underlain by shale beds. These are gently sloping to steep, stony soils on hillsides. They are most common on south-facing slopes.

In a representative profile, the 6 inch surface layer is light olive-brown calcareous clay that has numerous stone-sized fragments of sandstone on the surface (fig. 13). Below the surface layer, to a depth of 16 inches, is an olive-brown calcareous clay that rests on olive shaly clay.

Owens soils are used for native grass pastures. These soils have very slow permeability, rapid runoff, and a low available water capacity.

Representative profile of Owens stony clay, 3 to 20 percent slopes, in a pasture 30 feet north of a private road, from a point 0.15 mile west of the intersection of the private road and a county road. This intersection is 6.1 miles south on the county road from U.S. Highway 80 in Thurber, Tex.

A1—0 to 6 inches, light olive-brown (2.5Y 5/3) clay, olive brown (2.5Y 4/3) when moist; weak, fine and medium, blocky structure; very hard when dry, very firm when moist; crusts on drying; numerous small fragments of sandstone and limestone on the surface; calcareous; moderately alkaline; gradual, smooth boundary.

Bca—6 to 16 inches, olive-brown (2.5Y 4/4) clay, olive brown (2.5Y 4/4) when moist; moderate, medium, blocky structure; extremely hard when dry, very firm when moist; calcareous; moderately alkaline; gradual, smooth boundary.

C—16 to 28 inches, olive (5Y 5/4) shaly clay, olive (5Y 4/4) when moist; structureless; massive; extremely hard when dry, extremely firm when moist; few soft masses of calcium carbonate; calcareous; moderately alkaline.

The A horizon ranges from 4 to 10 inches in thickness. Color ranges from olive gray to light yellowish brown and red in hue of 2.5YR to 5Y, value of 4 to 6, and chroma of 2 to 4. Structure ranges from weak platy in the top one inch to strong, fine, irregular blocky and granular. The B horizon is 4 to 14 inches thick, has the same color ranges as the A horizon and, in some places, has mottling of light olive brown or yellowish brown. The C horizon is olive-gray and yellowish-brown alkaline clay shale that contains numerous calcium carbonate concretions.

Owens stony clay, 3 to 20 percent slopes (OwE).—This is a shallow, gently sloping to steep, shaly clay soil. The soil occupies stony, eroded, shaly hills. Slopes are generally 8 to 20 percent, but there are some short steep slopes of up to 45 percent. The surface is partially covered by numerous sandstone fragments ranging from 6 to 18 inches in diameter. This soil formed over olive, alkaline, Pennsylvanian shales.

This mapping unit is composed of 85 percent Owens stony clay, 3 to 20 percent slopes, and 15 percent inclusions of other soils. These inclusions are commonly very

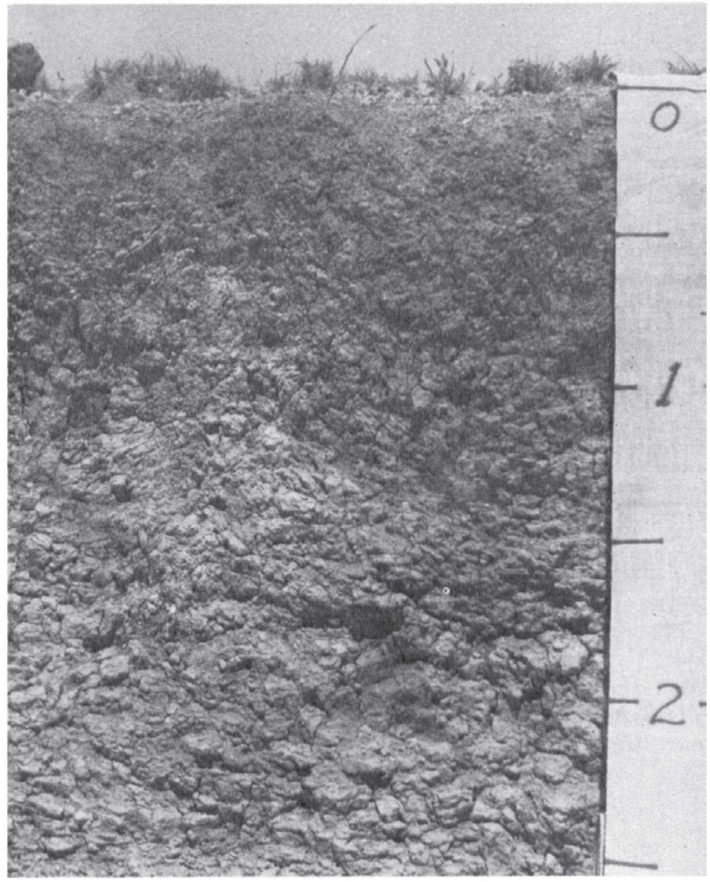


***Figure 13.*—Profile of Owens stony clay.**

severely eroded areas of Owens soils and Truce stony fine sandy loams, 5 to 40 percent slopes. Eroded areas are evident, and the surface horizon is missing where erosion has been severe. Also included are areas that have a sandy overwash from slopes above.

This Owens stony clay, 3 to 20 percent slopes, is used for range. (Capability unit VIIe-2; Shaly Hills range site)

Patilo Series

The Patilo series consists of deep, loose, sandy soils on undulating uplands. These Patilo soils are a major component of the Nimrod-Arenosa-Patilo fine sands mapping units.

In a representative profile, the 4 inch surface layer is neutral, loose, light brownish-gray fine sand. The subsurface layer, to a depth of about 50 inches, is white, loose, slightly acid fine sand (fig. 14). The sandy clay loam lower layer is strongly acid and is mottled in brownish yellow and red.

Most areas of the Patilo soils are in wooded native grass pastures. These soils are moderately slowly permeable, and their available water capacity is low.

Representative profile of Patilo fine sand, in an area of Nimrod-Arenosa-Patilo fine sands, in woods 40 yards northwest of a private road, from a point on the road 0.5 mile northeast of the intersection of the private road and

Figure 14.—**Profile of Patilo fine sand.**

a county road. This intersection is 1.1 miles southeast of Pilot Knob Church, which is about 7.5 miles northeast of Stephenville, Tex., by U.S. Highway 377 and a county road.

A1—0 to 4 inches, light brownish-gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) when moist; structureless; single grain; loose when dry or moist; neutral; clear, smooth boundary.

A2—4 to 50 inches, white (10YR 8/2) fine sand, light gray (10YR 7/2) when moist; structureless; single grain; loose when dry or moist, slightly acid; clear, wavy boundary.

B21t—50 to 70 inches, light-gray (10YR 7/1) sandy clay loam, light gray (10YR 6/1) when moist; many, medium, prominent, red (2.5YR 4/6) mottles and few, fine, distinct, brownish-yellow (10YR 6/6) mottles; weak, coarse, blocky structure; very hard when dry, very firm when moist; distinct clay films on ped faces; strongly acid; gradual, smooth boundary.

B3t—70 to 74 inches, white (10YR 8/1) sandy clay loam, light gray (10YR 7/1) when moist; many, medium, prominent, red (2.5YR 5/8) mottles and very few, fine, brownish-yellow (10YR 6/6) mottles; weak, coarse, blocky structure; hard when dry, firm when moist; strongly acid.

The A horizon ranges from 40 to 72 inches in thickness. The color of the A1 horizon ranges from very pale brown to dark grayish brown in hue of 10YR, value of 4 to 8, and chroma of 2 to 4. The A2 horizon is 1 to 3 units of value lighter in color, and reaction ranges from medium acid to neutral. The Bt horizons are mottled in shades of red, yellow, and gray, are strongly acid to medium acid, and are weak to moderate blocky in structure.

Purves Series

The Purves series consists of calcareous clayey soils that are shallow over limestone (fig. 15). These soils occupy gently sloping smooth areas and gently sloping to sloping benched areas.

In a representative profile, the surface layer is a very dark grayish-brown, calcareous, firm clay about 8 inches thick. Below the surface layer, to a depth of 14 inches, is a brown, calcareous, firm clay. Below a depth of 14 inches is fractured limestone bedrock.

Most Purves soils are used for native grass pastures. A few areas are cultivated. These soils are well drained, are moderately permeable, and have a low available water capacity.

Representative profile of Purves clay, 1 to 3 percent slopes, in a pasture 120 feet northwest of a private lane, from a point 0.27 mile northeast of its intersection with Farm Road 219. This intersection is 0.5 mile southeast of the center of Purves, Tex.

A11—0 to 8 inches, very dark grayish-brown (10YR 3/2) clay, very dark brown (10YR 2/2) when moist;

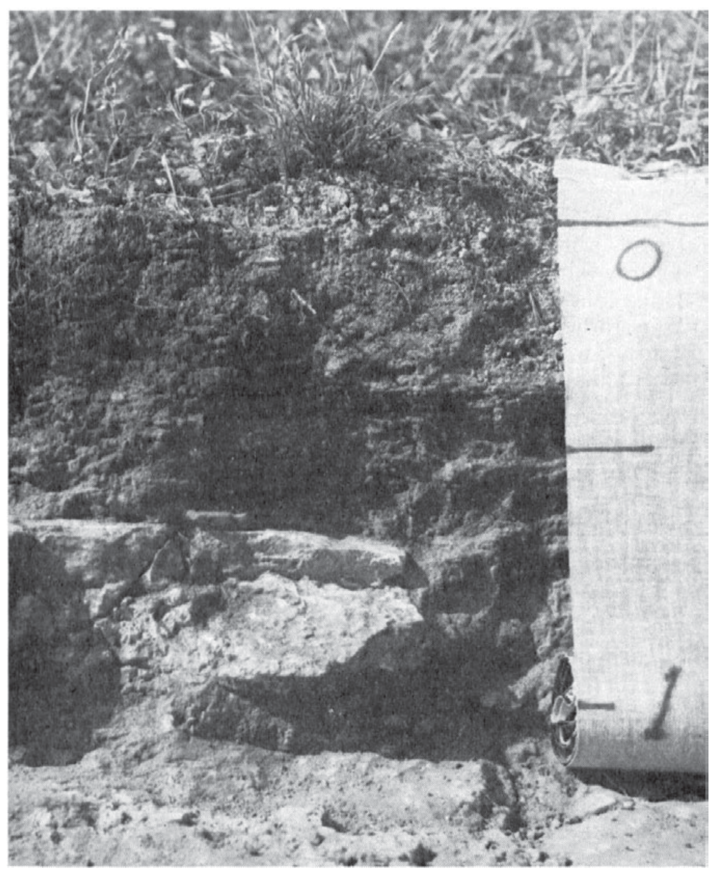


Figure 15.—**Profile of Purves clay.**

strong, very fine, subangular blocky and granular structure; very hard when dry, firm when moist; calcareous; moderately alkaline; gradual, smooth boundary.

A12—8 to 12 inches, brown (10YR 4/3) clay, dark brown (10YR 3/3) when moist; strong, very fine, subangular blocky and granular structure; hard when dry, firm when moist; calcareous; moderately alkaline; clear, smooth boundary.

A13—12 to 14 inches, brown (10YR 5/3) clay, dark brown (10YR 3/3) when moist; strong, fine, granular structure; hard when dry, firm when moist; 70 percent limestone fragments from 1 to 6 inches in diameter; calcareous; moderately alkaline; abrupt, smooth boundary.

R—14 inches, indurated limestone that has a few fractures.

The A horizons range from 6 to 20 inches in thickness. Gravelly, cobbly, and stony phases occur, but the horizons do not exceed 35 percent gravel, cobbles, or stones. The color of the A11 and A12 horizons is very dark grayish brown to brown in hue of 10YR to 7.5YR, (10YR dominantly), value of 2.5 to 5, and chroma of 2 or 3.

Purves clay, 1 to 3 percent slopes (PcB).—This gently sloping soil is shallow and underlain by hard limestone. Soil areas mainly are 10 to 40 acres in size, but some areas are in excess of 100 acres in size.

This soil has the profile described as representative for the Purves series.

Included in mapped areas of this soil are small areas of Bolar clay loam, Denton silty clay, and Dugout soils. Also included are small areas that have weakly cemented limestone underlying layers. These inclusions are less than 5 acres in size and make up less than 15 percent of any mapped area of this soil.

About half of the acreage of this Purves clay, 1 to 3 percent slopes, is in native range; the other half is cultivated. (Capability unit IIIe–5; Rolling Prairie range site)

Purves clay, 3 to 5 percent slopes (PcC).—This gently sloping soil is in areas 10 to 50 acres in size.

The dark grayish-brown to very dark grayish-brown, calcareous clay surface layer is about 16 inches thick and rests abruptly on hard white limestone.

Included in mapped areas of this soil are small areas of Bolar clay loam, Denton silty clay, and Dugout soils. Also included are small areas that have weakly cemented limestone underlying layers. These inclusions are less than 5 acres in size and make up less than 15 percent of any mapped area of this soil.

Most of this Purves clay, 3 to 5 percent slopes, is in native grass. A few areas are cultivated. (Capability unit IVe–2; Rolling Prairie range site)

Purves-Dugout complex (Pd).—This mapping unit consists of shallow, stony and gravelly, gently sloping to sloping soils. Slopes are dominantly 1 to 8 percent but some short slopes that are 8 to 20 percent are included. These soils formed over interbedded limestone and marl. They are in long narrow bands 75 to 100 feet wide in an intricate pattern. The areas of this unit have a gently rolling to distinct benched, or stairstep, appearance.

A representative area of this mapping unit contains about 37 percent Purves stony clay; 25 percent Dugout gravelly clay loam; 22 percent Maloterre soils; and 16 percent inclusions of other soils. Inclusions are mainly Bolar stony clay loam, Brackett gravelly clay loam, and other unclassified soils. Also included is a soil like Purves, except it contains more than 35 percent limestone fragments in the profile. About 40 percent of the mapped areas includes soils that have a 5 percent surface cover of limestone fragments that range in size from 4 to 24 inches. The rest of the areas have a 5 to 60 percent cover of gravel fragments.

The Purves soil is very dark grayish-brown calcareous clay about 14 inches thick underlain by hard limestone. The Dugout soil in this unit has the profile described as representative for the Dugout series. Maloterre soils have a grayish-brown calcareous clay loam surface layer about 8 inches thick over hard limestone.

The areas of this mapping unit are used for native range. (Capability unit VIs–1; Rolling Prairie range site)

Sandy Alluvial Land

Sandy alluvial land (Sa) consists of mixed, stratified, sandy soil material of the bottom lands. It occurs along small streams that do not have well defined channels.

The texture of the surface layer is not consistent. It ranges from sand to clay. Below the surface layer, the soil is sandy in most places and has underlying layers of sandy clay loam and clay. Reaction is neutral to calcareous.

Areas of this mapping unit are used for pasture. They are subject to frequent damaging overflow and have a water table 1 to 3 feet below the surface. (Capability unit Vw–1; Bottomland range site)

Selden Series

The Selden series consists of deep, sandy, gently sloping soils on uplands. These soils have sandy clay loam lower layers.

In a representative profile, the surface layer is slightly acid, pale-brown fine sand about 6 inches thick. The next layer, to a depth of 10 inches, is a very pale brown fine sand. The brownish-yellow to light-gray sandy clay loam lower layers are mottled in shades of brown, yellow, gray, and red. They are acid and extend to a depth of more than 60 inches.

Many areas of Selden soils are cultivated; other areas are in pasture. These soils are moderately well drained, are moderately slowly permeable, and have a high available water capacity.

Representative profile of Selden fine sand, 1 to 5 percent slopes, in a field 150 feet north of Farm Road 2303, from a point 3.6 miles northwest of the intersection of Farm Road 2303 and Texas Highway 108, which is 1.4 miles northwest of the Erath County courthouse in Stephenville, Tex.

Ap—0 to 6 inches, pale-brown (10YR 6/3) fine sand, brown (10YR 5/3) when moist; structureless; single grain; loose when dry, very friable when moist; slightly acid; clear, smooth boundary.

A2—6 to 10 inches, very pale brown (10YR 8/3) fine sand, pale brown (10YR 6/3) when moist; structureless; single grain; loose when dry or moist; slightly acid; clear, wavy boundary.

B21t—10 to 24 inches, brownish-yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) when moist; many, fine to medium, prominent, light brownish-gray and red mottles; weak, fine, subangular blocky

structure; very hard when dry, firm when moist; continuous clay films; medium acid; gradual, wavy boundary.

B22t—24 to 36 inches, coarsely mottled yellow (10YR 7/6), light gray (10YR 7/1), and red (2.5YR 5/8) sandy clay loam; weak, medium, blocky structure; very hard when dry, firm when moist; patchy clay films; medium acid; gradual, wavy boundary.

B23t—36 to 48 inches, light-gray (10YR 7/1) sandy clay loam, gray (10YR 6/1) when moist; common, medium, prominent, yellow and red mottles; weak, medium, blocky structure; very hard when dry, firm when moist; medium acid; gradual, wavy boundary.

B3t—48 to 62 inches, light-gray (10YR 7/1) sandy clay loam, gray (10YR 6/1) when moist; common, medium, distinct, yellow mottles and a few, fine, prominent, red mottles; weak, medium, blocky structure; very hard when dry, firm when moist; medium acid.

The A horizons range from 4 to 20 inches in thickness and from fine sand to loamy sand in texture. The A1 horizon ranges from very pale brown to dark grayish brown in color. The A2 horizon is 1 to 3 units of value lighter in color, and reaction ranges from medium acid to neutral. The Bt horizons extend more than 60 inches below the surface. They are mottled throughout with mottles of chroma 2 or less in red, yellow, gray, and brown. Structure is weak blocky to subangular blocky, and reaction is slightly acid to strongly acid.

Selden fine sand, 1 to 5 percent slopes (SdC).—This soil is in irregular areas that have mixed concave and convex surfaces.

This soil has the profile described as representative for the Selden series.

Included in mapped areas of this soil are small areas of Nimrod fine sand, 0 to 5 percent slopes; Windthorst loamy very fine sand, 1 to 5 percent slopes; and Selden soils that are moderately eroded. These inclusions make up less than 15 percent of any mapped area of this soil.

Most of this Selden fine sand, 1 to 5 percent slopes, is cultivated. (Capability unit IIIe–3; Sandy range site)

Selden soils, 1 to 5 percent slopes, eroded (SeC2).—These eroded gently sloping soils are in small, irregular, convex areas on uplands. Part of the original surface layer has been removed by erosion, and the present surface layer is a mixture of the surface layer and underlying layers. In shallow gullies and on low knolls, the lower layers are exposed. In some places, soil material has drifted from eroded areas and formed fence row dunes.

The texture of the surface layer ranges from fine sand to loamy sand. Most surface layers have about 4 inches of fine sand.

Included with these soils in mapping are small areas of Windthorst, Selden, and Chaney soils. These inclusions account for less than 10 percent of any area of the soils.

These Selden soils, 1 to 5 percent slopes, eroded, are best suited to grass, but crops are grown. Some fields have been reseeded to native grasses. (Capability unit IVe–5; Sandy range site)

Somervell Series

The Somervell series consists of moderately deep, very gravelly, loamy soils. These are strongly sloping to steep soils on hillsides.

In a representative profile, the very dark grayish-brown, calcareous very vravelly clay loam surface layer is about 16 inches thick. Below the surface layer, to a depth of about 32 inches, is light brownish-gray, calcareous very gravelly clay loam that rests abruptly on hard limestone.

These soils are used for native grass pasture. The soils are well drained, and permeability is moderate. The available water capacity is low.

Representative profile of Somervell very gravelly clay loam, in an area of Somervell-Maloterre complex, in a pasture on the side of a gravelly hill above a mott of Spanish Oak, 160 yards east of a county road, from a point 1.3 miles southeast of the intersection of the county road and Texas Highway 220. This intersection is 4.9 miles southwest of the junction of Texas Highway 220 and U.S. Highway 67; this junction is 18.4 miles southeast of the Erath County courthouse in Stephenville, Tex.

A1—0 to 16 inches, very dark grayish-brown (10YR 3/2) very gravelly clay loam, very dark brown (10YR 2/2) when moist; strong, very fine, granular structure; hard when dry, friable when moist; 55 percent gravel- and cobble-sized limestone fragments; calcareous; moderately alkaline; gradual, smooth boundary.

B2—16 to 32 inches, light brownish-gray (10YR 6/2) very gravelly clay loam, dark grayish brown (10YR 4/2) when moist; strong, very fine, granular structure; hard when dry, friable when moist; 80 percent gravel-sized limestone fragments; calcareous; moderately alkaline; abrupt, wavy boundary.

R—32 to 36 inches, strongly cemented limestone bedrock; top 4 inches soft enough to cut with auger.

The texture of the A and B horizons ranges from loam to clay loam, and the clay content is 20 to 35 percent. The color of the A horizon ranges from grayish brown to dark brown in hue of 10YR, value of 3 to 5.4, and chroma of 1.5 to 3. From 35 to 85 percent of both the A and B horizons is made up of gravel-, cobble-, and stone-sized limestone fragments. The B2 horizon is very pale brown to grayish brown in hue of 10YR, value of 5 to 7, and chroma of 1.5 to 3. The underlying limestone is weakly to strongly cemented.

Somervell-Maloterre complex (Sm).—This mapping unit consists of moderately deep to very shallow very gravelly soils on long, narrow limestone hillsides. Slopes range from 8 to 40 percent. The areas are 200 to 600 feet wide and are several miles long. The soils are in a mixed pattern that makes separation impractical.

A representative area of this mapping unit contains about 30 percent Somervell very gravelly clay loam; 25 percent Maloterre soils; 15 percent Dugout gravelly clay loam; 15 percent rock outcrop and unclassified soils; and 15 percent inclusions of other named soils. Limestone fragments, on the surface and through the profile, make up 30 to 90 percent of these soils. The limestone fragments range from 1/4 inch to 20 inches in size, but are dominantly 1/4 inch to 8 inches in size.

Somervell soil is very gravelly calcareous clay loam that is 35 to 80 percent limestone fragments. The underlying layer of hard limestone is at a depth of about 32 inches.

Maloterre soil is calcareous clay loam about 8 inches thick underlain by hard limestone.

Dugout soil has a light brownish-gray calcareous gravelly clay loam surface layer about 7 inches thick. The lower layers are very pale brown clay loams that rest abruptly on hard limestone at a depth of about 18 inches.

The limestone rock outcrops are confined mostly to the higher part of each mapped area. Inclusions are mainly

areas of Brackett gravelly clay loam and Lewisville clay loam. Brackett soils generally are on south-facing slopes. Lewisville soils lie along foot slopes.

The areas of this mapping unit are in native range. They are too steep and gravelly for cultivation. (Capability unit VIIs-1; Rolling Prairie range site)

Thurber Series

The Thurber series consists of moderately deep to deep loamy soils (fig. 16). These nearly level to gently sloping soils lie in valleys.

In a representative profile, the 8 inch surface layer is dark grayish-brown mildly alkaline clay loam. The next layer is brown, very firm, alkaline clay. Below a depth of 20 inches is brown to yellowish-brown calcareous clay.

Most of the acreage of these soils is used for native grass pasture. A few areas are cultivated. These soils are moderately well drained, are very slowly permeable, and have a high available water capacity.

Representative profile of Thurber clay loam, in an area of Thurber and Waurika soils, in a pasture 75 yards west of Texas Highway 108, from a point 18.5 miles north-northwest of the Erath County courthouse in Stephenville, Tex., and 1 mile north of the Ex-Ray Gas Plant.

A1—0 to 8 inches, dark grayish-brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium to thick, platy structure in upper 2 inches and massive structure below a depth of 2 inches; very hard when dry, very firm when moist; mildly alkaline; abrupt, smooth boundary.

B21t—8 to 20 inches, brown (10YR 4/3) clay, dark brown (10YR 3/3) when moist; strong, fine, blocky structure; very hard when dry, very firm when moist; continuous clay films; mildly alkaline; clear, wavy boundary.

B22t—20 to 38 inches, brown (10YR 4/3) clay, dark brown (10YR 3/3) when moist; strong, fine, blocky structure; very hard when dry, very firm when moist; few, very fine, soft and hard calcium carbonate concretions; calcareous; moderately alkaline; gradual, wavy boundary.

C1ca—38 to 48 inches, brown (10YR 5/3) clay, brown (10YR 4/3) when moist; moderate, fine, blocky structure; hard when dry, friable when moist; common threads, films, and soft concretions of calcium carbonate; calcareous; moderately alkaline; gradual, wavy boundary.

C2—48 to 62 inches, yellowish-brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) when moist; weak subangular blocky structure; hard when dry, friable when moist; calcareous; moderately alkaline.

The A horizon ranges from clay loam to silt loam in texture and from slightly acid to mildly alkaline in reaction. Color ranges from grayish brown to dark brown in hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1.5 to 4. The surface of the A horizon is massive and hard to very hard when dry. The B2t horizon is a blocky compact clay that is 40 to 60 percent clay. It is neutral in the upper part to moderately alkaline in the lower part; is brown to very dark brown in hue of 10YR or 2.5Y, value of 2 to 5, and chroma of 1.5 to 4; and has moderate, fine, blocky structure to strong, medium, blocky structure. The C horizon is brownish alkaline clay to olive-gray shaly clay.

Thurber and Waurika soils (Tk).—This mapping unit consists of moderately deep to deep, loamy, very slowly permeable soils. These nearly level to gently sloping soils are in valleys.

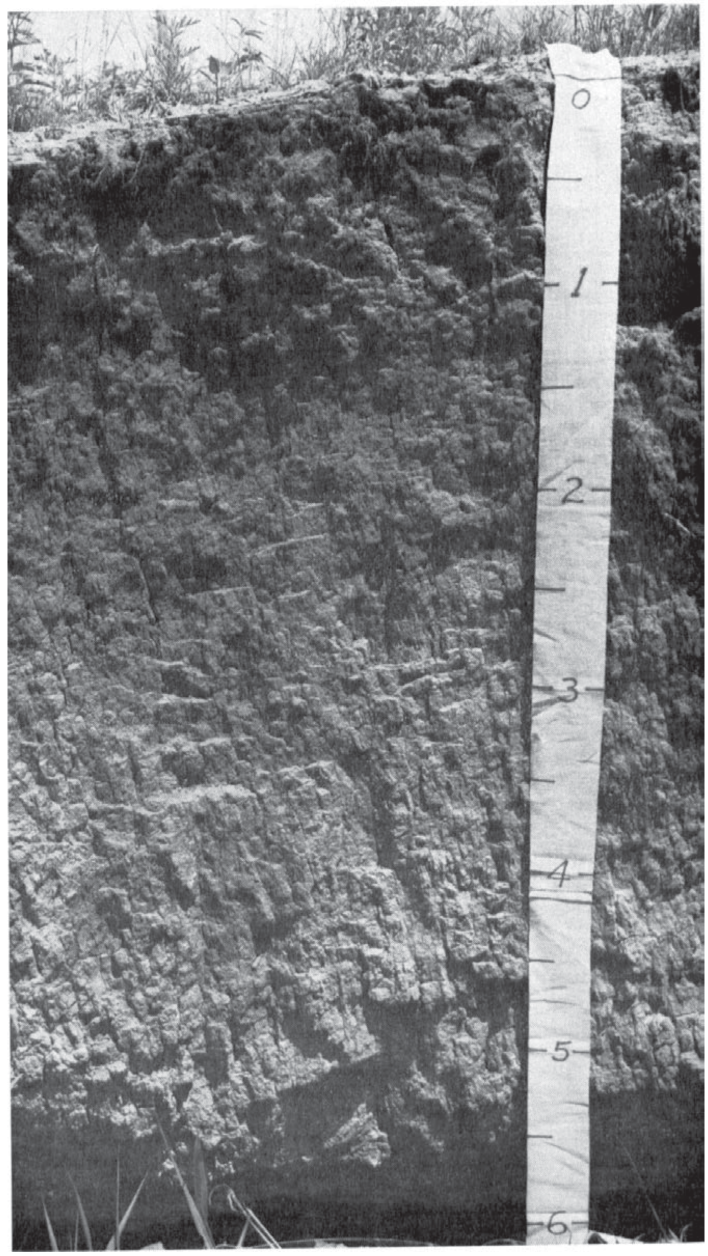


Figure 16.—Profile of Thurber clay loam.

Areas of this mapping unit are composed of Thurber clay loam, 0 to 3 percent slopes, and Waurika fine sandy loam, 0 to 3 percent slopes. A mapped area may consist of one component alone or any combination of the components. About 60 percent of the areas are Thurber clay loam.

The Thurber component of this unit has the profile described as representative for the Thurber series.

The Waurika soil has a grayish-brown, slightly acid fine sandy loam surface layer about 7 inches thick. The next layer is gray, neutral fine sandy loam about 4 inches thick. The next lower layer, to a depth of 34 inches, is very dark gray clay. Beneath this layer, to a depth of 50 inches, is dark-gray clay. Below a depth of 50 inches is gray calcareous clay loam.

Included in this mapping unit are small areas of Owens stony clay, 3 to 20 percent slopes, and Truce fine sandy loam, 1 to 5 percent slopes.

Some of the nearly level to gently sloping areas of this mapping unit have been cultivated. Most fields are now reseeded to grass. (Capability unit IIIe-6; Tightland range site)

Trinity Series

The Trinity series consists of deep clayey soils. These nearly level soils lie in bands along the flood plains of major streams.

In a representative profile, the soil is dark-gray, calcareous, very firm clay about 52 inches thick. Below a depth of 52 inches is grayish-brown very firm clay.

Most of these soils are cultivated. Some areas are in native grass and pecan trees. These soils flood occasionally. They are moderately well drained to somewhat poorly drained, and their permeability is slow to very slow. Their available water capacity is high.

Representative profile of Trinity clay, occasionally flooded, in a field 0.5 mile southwest of the Barton Creek bridge, which is 1 mile south on a county road from U.S. Highway 80 and 1 mile east of the intersection of U.S. Highway 80 and Texas Highway 108. This intersection is approximately 23 miles north-northwest of Stephenville, Tex.

Ap—0 to 6 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; moderate, very fine and fine, subangular blocky and granular structure; very hard when dry, very firm when moist; calcareous; moderately alkaline; clear, smooth boundary.

A12—6 to 26 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; moderate, fine and medium, blocky structure; very hard when dry, very firm when moist; calcareous; moderately alkaline; gradual, wavy boundary.

A13—26 to 52 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; moderate, fine and medium, subangular blocky structure; very hard when dry, very firm when moist; few fine calcium carbonate concretions; calcareous; moderately alkaline; gradual, wavy boundary.

C—52 to 60 inches, grayish-brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) when moist; very hard when dry, very firm when moist; threads and films of calcium carbonate.

The A horizon has gradual to diffuse boundaries and ranges in color from dark gray to very dark grayish brown in hue of 10YR, value of 3 or 4, and chroma of 1 to 1.5. The C horizon is gray to dark grayish-brown calcareous clay. In some areas the underlying layer, below a depth of 40 inches, is pale brown and has some stratification.

Trinity clay, occasionally flooded (Tn).—This nearly level soil occupies bands along the flood plains of creeks. These areas are 10 to 100 acres in size, have slopes of 0 to 1 percent, and flood occasionally.

Most areas of this soil are cultivated. Some areas are in native grass and pecan trees. (Capability unit IIs-1; Bottomland range site)

Truce Series

The Truce series consists of moderately deep, loamy, gently sloping to steep soils on uplands.

In a representative profile, the Truce soils have a brown, slightly acid fine sandy loam surface layer about 3 inches thick. The subsurface layer is pale-brown fine sandy loam about 5 inches thick. The next layers, to a depth of about 30 inches, are brown to reddish-brown, alkaline, very firm, blocky clay. The underlying material, below a depth of 30 inches, is calcareous shaly clay that grades to shale at a depth of about 40 inches.

Most of these soils are used for native grass pasture. A few areas are cultivated. The permeability of these soils is slow, and the available water capacity is moderate.

Representative profile of Truce fine sandy loam, 1 to 5 percent slopes, in a wooded pasture 75 feet east of Texas Highway 108, from a point 0.95 mile south of the junction of Texas Highway 108 and U.S. Highway 80. The point on Texas Highway 108 is about 22 miles north-northwest of Stephenville, Tex.

A1—0 to 3 inches, brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; slightly acid; abrupt, smooth boundary.

A2—3 to 8 inches, pale-brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; slightly acid; abrupt, wavy boundary.

B21t—8 to 22 inches, reddish-brown (5YR 4/4) clay, dark reddish brown (5YR 3/4) when moist; moderate, fine and medium, blocky structure; extremely hard when dry, very firm when moist; distinct clay films; mildly alkaline; gradual, wavy boundary.

B22t—22 to 30 inches, brown (7.5YR 5/4) clay, brown (7.5YR 4/4) when moist; few, fine, distinct, yellowish-brown mottles; moderate, fine and medium, blocky structure; extremely hard when dry, very firm when moist; distinct clay films; mildly alkaline; gradual, wavy boundary.

B3—30 to 40 inches, light yellowish-brown (10YR 6/4) shaly clay, yellowish brown (10YR 5/4) when moist; weak, medium, blocky structure; extremely hard when dry, very firm when moist; calcareous; moderately alkaline; clear, wavy boundary.

R—40 to 60 inches, pale-olive (5Y 6/3) fissile shale, olive (5Y 5/3) when moist; moderately alkaline.

The A1 horizon ranges from 2 to 6 inches in thickness. Fine sandy loam is the principal texture, but areas of stony fine sandy loam occur. Color ranges from brown to yellowish brown in hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The A2 horizon is absent in some places but is prominent in most profiles. It is 0 to 7 inches thick and light yellowish brown to grayish brown in hue of 10YR or 7.5YR, value of 5 to 6, and chroma of 2 to 4. Reaction ranges from slightly acid to neutral.

The B2t horizon ranges from 14 to 36 inches in thickness. Clay content ranges from 40 to 60 percent. The upper B2t horizon is unmottled and ranges from dark reddish brown to yellowish red in hue of 5YR or 7.5YR, value of 3 to 6, and chroma of 4 to 6. The lower B2t horizon is reddish brown to brownish yellow in hue of 10YR to 5YR, value of 3 to 6, and chroma of 4 to 6. Most profiles are mottled in shades of yellowish brown to olive brown. The reaction of the B2t horizon ranges from neutral in the upper part to moderately alkaline in the lower part.

The B3 horizon ranges from 4 to 20 inches in thickness and from sandy clay to shaly clay in texture. Color is light yellowish brown to olive brown in hue of 10YR or 2.5Y, value of 4 to 6, and a chroma of 4. This horizon has olive mottles in some profiles. Thickness of the solum is 20 to 48 inches, and depth to shale is 30 to 60 inches.

Truce fine sandy loam, 1 to 5 percent slopes (TrC).—This gently sloping soil formed mainly in alkaline clays

and shales. Mapped areas of this soil are composed of about 75 percent Truce fine sandy loam, 1 to 5 percent slopes; 10 percent Truce stony fine sandy loam, 1 to 5 percent slopes; and 15 percent inclusions of other soils. Slopes are dominantly 1 to 3 percent but range from 1 to 5 percent. The stony Truce soils occupy intermingled knolls and ridges.

This soil has the profile described as representative for the Truce series.

Included with this soil in mapping are small areas of Bonti, Exray, and Owens soils. These inclusions make up less than 15 percent of any mapped area of this soil.

Most areas of this Truce fine sandy loam, 1 to 5 percent slopes, are in native range. A few areas were cultivated at one time. Many of these old fields have now been reseeded to grass. (Capability unit IIIe-6; Sandy Loam range site)

Truce stony fine sandy loam, 5 to 40 percent slopes (TuF).—This moderately deep, stony, sloping to steep soil occupies rough hills or ridges. It formed in acid to alkaline clay and shale. Slopes mainly are 5 to 20 percent, but short steep slopes up to 40 percent are common. Stones cover 10 to 45 percent of the surface; these sandstone fragments are 1 inch to 5 feet in diameter.

The surface layer is a brown slightly acid stony fine sandy loam about 4 inches thick. The next layer is reddish-brown, neutral to mildly alkaline, very firm, blocky clay. Below a depth of 36 inches is olive-brown, calcareous clay shale.

Included with mapped areas of this soil are small areas of Owens stony clay, 3 to 20 percent slopes, and Bonti-Exray stony fine sandy loams. These soils make up less than 15 percent of any mapped area.

This Truce stony fine sandy loam, 5 to 40 percent slopes, is used for range. It is too steep and stony for cultivation and is best suited to range and wildlife. (Capability unit VIe-5; Sandstone Hills range site)

Vashti Series

The Vashti series consists of moderately deep, gently sloping to sloping, sandy soils on uplands.

In a representative profile, the 14 inch surface layer is grayish-brown to light-brown, slightly acid loamy fine sand. The next layers, to a depth of about 40 inches, are yellowish-brown to yellow, medium acid sandy clay loam that is mottled in shades of red and gray. The underlying material, below a depth of 40 inches, is hard brown sandstone.

Most areas of these soils are in native grass pasture. These soils are moderately well drained, are moderately permeable, and have a moderate available water capacity.

Representative profile of Vashti loamy fine sand, 1 to 3 percent slopes, in woods 120 feet west of a county road and 0.55 mile south of the intersection of two county roads at the Russel Chapel Cemetery. This intersection is approximately 18 miles northwest of Stephenville, Tex., by Texas Highway 108, Farm Road 1715, and the county road.

A1—0 to 3 inches, grayish-brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) when moist; weak granular structure; soft when dry, very friable when moist; slightly acid; clear, smooth boundary.

A2—3 to 14 inches, light-brown (7.5YR 6/4) loamy fine sand, brown (7.5YR 5/4) when moist; structureless; single grain; soft when dry, very friable when moist; slightly acid; abrupt, smooth boundary.

B21t—14 to 26 inches, yellowish-brown (10YR 5/6) sandy clay loam, dark yellowish brown (10YR 4/6) when moist; few, fine, distinct, gray mottles and many, medium, distinct, red mottles; moderate, fine, subangular blocky structure; very hard when dry, firm when moist; continuous clay films; medium acid; gradual, smooth boundary.

B22t—26 to 40 inches, yellow (10YR 7/6) sandy clay loam, yellowish brown (10YR 5/6) when moist; common, medium, distinct, light-gray mottles that increase in abundance with depth; weak, fine, subangular blocky structure; patchy clay films; hard when dry, firm when moist; medium acid; abrupt, smooth boundary.

R—40 to 42 inches, strongly cemented brown sandstone.

The A horizon ranges from 8 to 16 inches in thickness and from neutral to slightly acid in reaction. Stony phases are common. The color of the A1 horizon ranges from dark grayish brown to brown in hue of 7.5YR to 10YR, value of 3 or 4, and chroma of 2 to 4. The A2 horizon is very pale brown to brownish yellow in hue of 10YR, value of 6 or 7, and chroma of 3 to 6.

The B2t horizons range from 12 to 34 inches in thickness and from neutral to medium acid in reaction. Structure is moderate, fine to medium, subangular blocky. Color ranges from brown to yellow in hue of 10YR to 7.5YR, value of 4 to 7, and chroma of 4 to 8. These horizons have common to many yellowish-red, light brownish-gray, dark yellowish-brown, and light-gray mottles. The B21t horizon ranges from sandy clay loam to clay loam in texture. Indurated, or cemented, sandstone occurs 20 to 50 inches below the surface.

Vashti loamy fine sand, 1 to 3 percent slopes (VaB).—This sandy soil occupies gently sloping, irregular, convex areas on uplands. Indurated sandstone underlies the soil at a depth of 20 to 50 inches and outcrops on the surface in some areas. After periods of heavy rainfall, water collects and stands on top of this underlying rock layer. This causes a periodic high, perched water table.

This soil has the profile described as representative for the Vashti series.

Included in mapped areas of this soil are small areas of Vashti stony loamy fine sand and Bonti stony fine sandy loam. Also included are small areas of an unclassified soil like this Vashti soil, except it is underlain by sandstone at depths of less than 20 inches. These inclusions make up less than 15 percent of any mapped area of this soil.

A few small fields of this Vashti loamy fine sand, 1 to 3 percent slopes, are cultivated. Some areas are in pasture. (Capability unit IIIe-3; Sandy range site)

Vashti stony loamy fine sand (Vh).—This sandy, gently sloping to sloping, stony soil occupies irregular areas on upland ridges. Slopes range from 1 to 8 percent but are dominantly 1 to 5 percent.

The surface layer is grayish-brown to very pale brown, neutral stony loamy fine sand about 14 inches thick. The next layers are brownish-yellow to yellow, medium acid sandy clay loam that are mottled in red and gray. Below a depth of 40 inches, the underlying material is hard sandstone.

This soil contains some sandstone rock outcrops and loose sandstone on and in the surface layer. These stones are usually low-lying stones that just protrude through the surface. This soil is 20 to 50 inches deep over hard sandstone bedrock.

Included with mapped areas of this soil are small areas of Vashti loamy fine sand, 1 to 3 percent slopes. Also included are small areas of an unclassified soil like this Vashti soil, except it is underlain by sandstone at depths of less than 20 inches. These inclusions make up less than 15 percent of any mapped area of this soil.

Most of this Vashti stony loamy fine sand is in wooded range. A few areas have been cleared and are now in native grass. This soil is too stony for cultivation and is best suited to range. (Capability unit VIe-4; Sandy range site)

Venus Series

The Venus series consists of deep loamy soils (fig. 17). These soils are nearly level to gently sloping and occupy stream terraces.

The 14 inch thick surface layer is dark grayish-brown, granular, calcareous loam. The next layers, to a depth of about 50 inches, are grayish-brown to very pale brown calcareous loam. Below a depth of 50 inches is very pale brown calcareous fine sandy loam.

Most areas of these soils are cultivated. A few are in pasture. These soils are well drained, are moderately permeable, and have a high available water capacity.

Representative profile of Venus loam, 1 to 3 percent slopes, in a field 320 yards south of a county road, from a point 2.2 miles north-northeast of the intersection of the county road and Farm Road 1189. This intersection is 5.6 miles northeast on Farm Road 1189 from the junction of Farm Roads 1189 and 1188, which is 3 miles east of Morgan Mill, Tex.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky and granular structure; hard when dry, friable when moist; few fine calcium carbonate concretions; calcareous; moderately alkaline; abrupt, smooth boundary.

A12—6 to 14 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky and granular structure; hard when dry, friable when moist; few fine calcium carbonate concretions; calcareous; moderately alkaline; gradual, smooth boundary.

B21—14 to 30 inches, grayish-brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) when moist; moderate, fine, subangular blocky and granular structure; hard when dry, friable when moist; many films and threads of calcium carbonate; calcareous; moderately alkaline; gradual, smooth boundary.

B22—30 to 50 inches, very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) when moist; moderate, fine, granular structure; hard when dry, friable when moist; many films and threads of calcium carbonate and a few fine pebbles; calcareous; moderately alkaline; clear, smooth boundary.

C—50 to 60 inches, very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) when moist; structureless; stratified with lenses of fine quartz and limestone gravel; calcareous; moderately alkaline.

The A horizon ranges from 10 to 18 inches in thickness, from loam to fine sandy loam in texture, and from weak subangular blocky structure to moderate, very fine, granular structure. Color ranges from grayish brown to dark brown in hue of 10YR, value of 3 to 5.4, and chroma of 2 or 3. The B2 horizon is 20 to 40 inches thick, loam to sandy clay loam, and grayish brown to very pale brown in hue of 10YR, value of 5 to 7, and chroma of 2 to 4. Threads and films of calcium carbonate are common to many. The C horizon contains many threads and films of calcium carbonate, some fine gravel, and a few fine calcium carbonate concretions.

Figure 17.—**Profile of Venus loam.**

Venus loam, 0 to 1 percent slopes, occasionally flooded (VlA).—This soil occupies low terraces on flood plains. It occurs where terraces have received deposition from sandy and clayey upland soils.

The surface layer is dark grayish-brown, granular, calcareous loam about 16 inches thick. Below this layer is a grayish-brown calcareous loam that extends to a depth of 60 inches.

Included with this soil in mapping are narrow stream channels of frequently flooded Bosque and Frio soils. Also included are areas of Venus soils that have a fine sandy loam surface. These inclusions make up less than 10 percent of any mapped area of this soil.

This Venus loam, 0 to 1 percent slopes, occasionally flooded, is suited to most crops grown in the county. There is little or no hazard of erosion. This soil may overflow occasionally, but overflows do not limit use for crops. The areas flood about once in 4 to 10 years. (Capability unit I-1; Deep Upland range site)

Venus loam, 1 to 3 percent slopes (VIB).—This gently sloping soil occupies bands along major streams. Soil areas are mainly less than 40 acres in size.

This soil has the profile described as representative for the Venus series.

Most of the acreage of this Venus loam, 1 to 3 percent slopes, is cultivated. Some areas are in pasture. (Capability unit IIe–1; Deep Upland range site)

Venus loam, 3 to 5 percent slopes (VIC).—This gently sloping soil occupies narrow bands along major streams.

The surface layer is dark grayish-brown calcareous loam about 14 inches thick. Below this layer is light yellowish-brown calcareous sandy clay loam that extends to a depth of 60 inches.

Much of the acreage of this Venus loam, 3 to 5 percent slopes, has been cultivated but is now in native grass. Some areas have been planted to pasture. (Capability unit IIIe–1; Deep Upland range site)

Waurika Series

The Waurika series consists of deep loamy soils. These soils are nearly level to gently sloping.

In a representative profile, the surface layer is grayish-brown slightly acid fine sandy loam about 7 inches thick. The subsurface layer is gray fine sandy loam about 4 inches thick. The next layers, to a depth of about 50 inches, are dark-gray to very dark gray blocky clay. The material below a depth of 50 inches is gray calcareous clay loam.

Most areas of these soils are used for crops. These soils are moderately well drained, are very slowly permeable, and have a high available water capacity.

Representative profile of Waurika fine sandy loam, 0 to 1 percent slopes, in a pasture 50 feet south of a private lane, from a point 0.2 mile west of a county road, which is 0.4 mile northwest of the intersection of the county road and Texas Highway 6. This intersection is 4 miles east of the junction of Texas Highway 6 and U.S. Highway 377 in Dublin, Tex.

A1—0 to 7 inches, grayish-brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; hard when dry, friable when moist; slightly acid; clear, wavy boundary.

A2g—7 to 11 inches, gray (10YR 6/1) fine sandy loam, dark gray (10YR 4/1) when moist; structureless; massive; porous; hard when dry, friable when moist; neutral; abrupt, wavy boundary.

B21tg—11 to 34 inches, very dark gray (10YR 3/1) clay, black (10YR 2/1) when moist; crushed peds are 1 unit of value lighter in color; moderate, medium, blocky structure; very hard when dry, very firm when moist; distinct clay films; medium acid; gradual, wavy boundary.

B22tg—34 to 50 inches, dark-gray (10YR 4/1) clay, very dark gray (10YR 3/1) when moist; weak, medium, blocky structure; very hard when dry, very firm when moist; patchy clay films; moderately alkaline; gradual, wavy boundary.

C—50 to 64 inches, gray (10YR 5/1) clay loam, very dark gray (10YR 3/1) when moist; structureless; hard when dry, firm when moist; calcareous; moderately alkaline.

The A horizon ranges from 6 to 30 inches in thickness. The color of the A1 horizon is dark grayish brown to brown in hue of 10YR to 7.5YR, value of 3 to 5.5, and chroma of 2 or 3. Reaction of this horizon is slightly acid to neutral. The A2g horizon is 4 to 10 inches thick, neutral to slightly acid, and gray to light gray in hue of 10YR, value of 5 to 7, and chroma of 1 or 2. The B2tg horizon is 16 to 45 inches thick, dark gray to light gray in hue of 10YR to 2.5Y, value of 3 to 6, and chroma of 1 or 2. Reaction ranges from medium acid in the upper part to moderately alkaline in the lower part. The C horizon is light-gray to grayish-brown calcareous clay and clay loam.

Waurika fine sandy loam, 0 to 1 percent slopes (WaA).—This nearly level soil occupies concave, oval to oblong areas 5 to 20 acres in size. A few areas are poorly drained.

This soil has the profile described as representative for the Waurika series.

Most of the acreage of this soil is cultivated. (Capability unit IIs–2; Tightland range site)

Waurika fine sandy loam, 1 to 3 percent slopes (WaB).—This gently sloping soil occupies concave areas 10 to 40 acres in size.

The surface layer is grayish-brown slightly acid fine sandy loam about 8 inches thick. The next layer is light-gray fine sandy loam about 4 inches thick. Below this layer, to a depth of about 50 inches, is grayish-brown to dark grayish-brown blocky clay. Below a depth of 50 inches is light-gray clay loam.

Most of the acreage of this Waurika fine sandy loam, 1 to 3 percent slopes, is cultivated. (Capability unit IIIe–6; Tightland range site)

Waurika fine sandy loam, 1 to 3 percent slopes, eroded (WaB2).—This gently sloping soil occupies concave eroded areas 10 to 40 acres in size. Shallow gullies and thin spots expose the lower layers at points of water concentration. The surface layer is about 6 inches thick.

This soil is best suited to grass, but some crops are grown. (Capability unit IVe–3; Tightland range site)

Waurika fine sandy loam, thick surface, 0 to 2 percent slopes (WkA).—This nearly level to gently sloping soil lies near streams and in valleys throughout the county. Soil areas are oblong and 10 to 50 acres in size.

The surface layer is grayish-brown to dark grayish-brown, acid fine sandy loam about 12 inches thick. The next layer is light-gray, acid fine sandy loam about 6 inches thick. The next lower layers are light-gray to dark-gray, acid clays. The underlying material is gray, neutral sandy clay loam.

Most areas of this soil are cultivated. (Capability unit IIs–2; Sandy Loam range site)

Windthorst Series

The Windthorst series consists of deep to moderately deep loamy to sandy soils (fig. 18). These gently sloping to sloping soils are on uplands.

In a representative profile, the 3 inch surface layer is light brownish-gray fine sandy loam. The next layer is very pale brown fine sandy loam about 5 inches thick. The next layers, to a depth of about 34 inches, are reddish-brown to yellowish-red sandy clay. The underlying layer, to a depth of 42 inches, is mottled yellowish-red and reddish-yellow sandy clay loam. The material below a depth of 42 inches is very pale brown fine sand.

Most areas of these soils are cultivated. Some areas are in pasture. The soils are moderately well drained, are moderately slowly permeable, and have a high available water capacity.

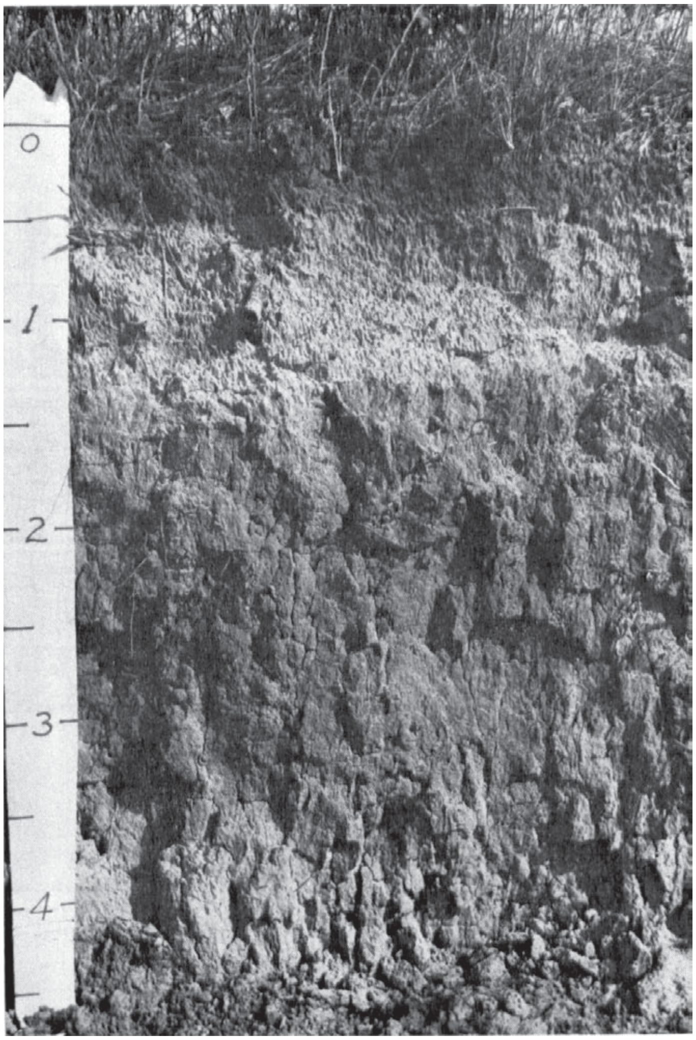


Figure 18.—**Profile of Windthorst fine sandy loam.**

Representative profile of Windthorst fine sandy loam, 1 to 3 percent slopes, in woods 60 feet southeast of U.S. Highway 377, from a point 5.4 miles northeast on U.S. Highway 377 from the Erath County courthouse in Stephenville, Tex.

A1—0 to 3 inches, light brownish-gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; neutral; clear, smooth boundary.

A2—3 to 8 inches, very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) when moist; weak, fine, subangular blocky structure; slightly hard when dry, friable when moist; slightly acid; abrupt, smooth boundary.

B21t—8 to 18 inches, reddish-brown (2.5YR 4/4) sandy clay, dark reddish brown (2.5YR 3/4) when moist; strong, medium, blocky structure; very hard when dry, very firm when moist; continuous clay films; medium acid; gradual, smooth boundary.

B22t—18 to 34 inches, yellowish-red (5YR 5/6) sandy clay, yellowish red (5YR 4/6) when moist; few, fine, very pale brown mottles; strong, medium, blocky structure; very hard when dry, very firm when moist; discontinuous clay films; strongly acid; clear, wavy boundary.

C1—34 to 42 inches, mottled yellowish-red (5YR 5/6) and reddish-yellow (7.5YR 6/6) sandy clay loam; structureless; hard when dry, friable when moist; medium acid; clear, wavy boundary.

IIC2—42 to 60 inches, very pale brown (10YR 8/4) fine sand, very pale brown (10YR 7/4) when moist; structureless; massive; hard to very hard when dry, loose when moist; medium acid.

The A horizon ranges from 5 to 18 inches in thickness, from fine sandy loam to loamy very fine sand in texture, and from neutral to medium acid in reaction. The color of the A1 horizon ranges from dark brown to yellowish brown in hue of 7.5YR or 10YR, value of 2 to 6, and chroma of 2 to 4. The A2 horizon ranges from 1 to 3 units of value lighter in color than the A1.

The B2t horizons range from 10 to 32 inches in thickness, from clay loam to clay in texture, and from medium acid to strongly acid in reaction. Color ranges from red and reddish brown to yellowish red in hue of 2.5YR to 5YR, value of 3 to 5, and chroma of 4 to 8. The lower part contains red to yellowish-brown mottles. Structure of the Bt horizons ranges in grade from weak to strong, in size from very fine to coarse, and in type from blocky to subangular blocky. Some areas have a red sandy clay loam B3 horizon grading to the C.

The C1 horizon ranges from sandy clay loam to stratified sands that are yellow, brown, red, and light gray. This horizon is slightly acid to mildly alkaline. In places this layer is missing and the solum rests on packsand.

Windthorst fine sandy loam, 1 to 3 percent slopes (WoB).—This gently sloping, loamy soil occupies convex uplands.

The profile of this soil is described as representative for the Windthorst series.

Included with mapped areas of this soil are small areas of Windthorst soils, eroded, and Duffau fine sandy loam. These inclusions make up less than 15 percent of any mapped area of this soil.

Most areas of this soil are cultivated. (Capability unit IIe-3; Sandy Loam range site)

Windthorst fine sandy loam, 1 to 3 percent slopes, eroded (WoB2).—This gently sloping eroded soil occupies irregular convex areas on uplands. Part of the original surface layer has been removed by erosion. In some areas soil blowing has been active and small acumulations of sand have built up in fence rows.

The surface layer is about 5 inches thick. Below this layer, to a depth of 40 inches, is red to reddish-brown, acid sandy clay that has yellowish-brown mottles. Below a depth of 40 inches is fine-grained packsand.

Included in mapped areas of this soil are small areas of Chaney, Selden, and Duffau soils. Also included are small areas of Windthorst soils that are severely eroded. These inclusions make up less than 15 percent of any mapped area of this soil.

Most of the acreage of this Windthorst fine sandy loam, 1 to 3 percent slopes, eroded, is cultivated. Some fields have been reseeded to pasture. (Capability unit IIIe-2; Sandy Loam range site)

Windthorst fine sandy loam, 3 to 5 percent slopes (WoC).—This gently sloping, loamy soil occupies convex uplands.

The surface layer is grayish-brown to very pale brown, slightly acid fine sandy loam about 8 inches thick. Beneath this layer, to a depth of 40 inches, is red to reddish-yellow, medium acid clay that is mottled with very pale brown. The underlying material, below a depth of 40 inches, is interbedded gray sand, yellowish-brown clay, and thin lenses of gray shale.

Most areas of this soil are cultivated. (Capability unit IIIe–2; Sandy Loam range site)

Windthorst fine sandy loam, 5 to 8 percent slopes (WoD).—This sloping soil lies on convex erosional uplands.

The surface layer is grayish-brown to light brownish-gray, slightly acid fine sandy loam about 6 inches thick. Below this layer, to a depth of 35 inches, is reddish-brown sandy clay that is mottled with light yellowish-brown in the lower part. A fine sand layer is at a depth of about 35 inches.

Included in mapped areas of this soil are small areas that are moderately eroded.

Most areas of this soil are in grass or woods. This soil is subject to a severe hazard of erosion. With careful management, it can be cultivated, but it is best suited to grass. (Capability unit IVe–4; Sandy Loam range site)

Windthorst loamy very fine sand, 1 to 5 percent slopes (WnC).—This gently sloping sandy soil occupies irregular areas that have mostly convex surfaces.

The surface layer is grayish-brown to pale-brown, slightly acid loamy very fine sand about 12 inches thick. Below this layer is a red, medium acid, very firm clay that has faint mottles of red and light yellowish brown. A sandy loam layer occurs at a depth of about 34 inches, and fine sand is at a depth of about 50 inches (fig. 19).

Included in mapped areas of this soil are small areas of Selden fine sand, 1 to 5 percent slopes, and Windthorst soils, 3 to 5 percent slopes, eroded. Also included are small areas of Duffau loamy fine sand, 0 to 5 percent slopes. These inclusions amount to less than 15 percent of any mapped area of this soil.

Most areas of this Windthorst loamy very fine sand, 1 to 5 percent slopes, are cultivated. A few areas are in pasture. (Capability unit IIIe–3; Sandy range site)

Windthorst soils, 3 to 5 percent slopes, eroded (WsC2).—These gently sloping eroded soils occupy irregular convex areas on uplands. Part of the original surface layer has been removed by erosion, and the present surface layer is a mixture of the surface layer and material from lower layers. Crossable gullies are at intervals of 30 to 200 feet.

The surface layer is about 4 inches thick and ranges from sandy clay loam to loamy very fine sand. Beneath the surface layer is reddish-brown sandy clay that has yellowish-brown and yellowish-red mottles. Below a depth of 28 inches is sandy loam.

Included in mapped areas of the soils are small areas of severely eroded Windthorst soils, Selden soils, and Duffau soils. These inclusions make up less than 15 percent of any mapped area of these Windthorst soils.

These Windthorst soils, 3 to 5 percent slopes, eroded, are best suited to grass, but some crops are grown. Many fields have been reseeded to grass. (Capability unit IVe–4; Sandy Loam range site)

Windthorst soils, 1 to 8 percent slopes, severely eroded (WsD3).—These gently sloping to sloping soils occupy convex areas on uplands. They have been severely damaged by soil blowing and sheet and gully erosion. The areas are dissected at intervals of 20 to 100 feet by gullies that are 2 to 4 feet deep.

The surface layer is variable in texture and thickness. It ranges from 2 to 6 inches thick. The thickest layers are about midway between the gullies. Below the surface layer is red to yellowish-red, firm, acid clay. At a depth of about 30 inches is mottled sandy clay loam.

Included in mapped areas of the soils are small areas of eroded Duffau, Selden, and Chaney soils. Also included are small areas of Windthorst soils that are moderately eroded. These inclusions make up less than 15 percent of any mapped area of these soils.

Most areas of these Windthorst soils, 1 to 8 percent slopes, severely eroded, have been cultivated in the past but are now in grass. These severely eroded soils are best suited to range. Costly reclamation would be required before they would be suitable for cultivation. (Capability unit VIe–2; Sandy Loam range site)

Use and Management of Soils

In this section capability grouping of soils is explained, management of the soils by capability unit is described, and estimated yields of crops are given for a high level of management. A brief discussion of general soil management practices is included. Use of the soils for range, wildlife habitat, recreation, and engineering purposes also are discussed.

General Practices of Soil Management

The chief hazards in farming the soils in Erath County results from the limited rainfall, the poor distribution of rainfall, periods of drought, rainstorms of damaging intensity, and high winds. The objectives of good management are to protect the soil against water erosion and soil blowing, to maintain and improve the physical condition of the soil so that it will take up and hold more of the rainfall, and to improve the productivity of the soil.

Many of the soils of Erath County are best suited to pasture or hay because they are steep, shallow, subject to damage when cultivated, or frequently flooded. Many soils in the county that are suited to cultivation are used for hay or pasture because the operator prefers this. Introduced grasses commonly planted for hay and pasture are Coastal and common bermudagrass, johnsongrass, weeping lovegrass, King Ranch bluestem, and blue panicgrass. Several native species of grass, such as indiangrass and switchgrass, respond to tame pasture treatment and are suitable for this purpose.

Sound grazing management is necessary for sustained high production from all pastures. It is important to let grasses recover for a period of time after they have been grazed. Since the plant manufactures its food in the leaves, enough leaf surface must be left on the plant during the growing season to allow this process to take place at a rapid rate. Leaving a good supply of plant material on the land helps control erosion, improves the physical condition of the soil, and protects the plants from extreme temperatures. The amount of leaf surface needed varies with the species of grass.

For sustained economic production of hay, livestock feed, or other crops, a sound program of fertilization is needed on all the soils of the county. The kinds and amounts of commercial fertilizer needed are best deter-

Figure 19.—**Peanut field after harvest. Soils are protected by wind strips of sudangrass and a cover crop of rye and vetch.**

mined by soil testing and the experience of other local producers.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, all kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

Capability Classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife habitat, water supply, or to esthetic purposes. There are no Class VIII soils in Erath County.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*,

450-374—72——4

used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In Class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in Class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–3 or IIIe–6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units [2]

In the following pages each of the capability units in Erath County is described, and suggestions for use and management of the soils are given. The capability unit designation for each soil in the county can be found in the "Guide to Mapping Units."

CAPABILITY UNIT I–1

This unit consists of deep, well-drained, nearly level soils in valleys and on bottom lands. These soils have a fine sandy loam or clay loam surface layer and moderately to moderately slowly permeable lower layers. They have a high available water capacity.

Most areas are cultivated. Sorghum, small grain, and cotton are the main crops, and alfalfa also is grown. Pecans do well on these soils. Peanuts are suited to the fine sandy loams.

A cropping system that conserves moisture and maintains the structure of the surface soil is needed.

These soils are also suited to pasture. Among the grasses that grow well are bermudagrass, johnsongrass, and King Ranch bluestem.

CAPABILITY UNIT I–2

This unit consists of well-drained, nearly level soils on stream terraces, in valleys, and on uplands. These soils have a fine sandy loam surface layer and moderately permeable lower layers. They have a high available water capacity.

Most areas of these soils are cultivated. Peanuts, small grain, and sorghum are the main crops. Orchards also do well on these soils.

A cropping system that conserves moisture and maintains soil structure is needed.

These soils are also suited to pasture and hay crops. Bermudagrass and johnsongrass are adapted grasses that generally produce well on these soils.

CAPABILITY UNIT IIe–1

This unit consists of moderately deep to deep gently sloping soils that have a loam, clay loam, or silty clay surface layer. These soils have moderately, moderately slowly, and slowly permeable lower layers. Because of their slope, these soils are moderately susceptible to erosion. They have a moderate to high available water capacity.

Most areas of these soils are cultivated. The major crops are small grain, sorghum, and cotton. Cool-season crops, such as small grain, sweetclover, and buttonclover, are well suited to these soils.

A cropping system that controls erosion and conserves moisture is needed. Terraces, waterways, and contour tillage are needed if the soils are used for row crops. If a drilled crop, such as small grain, is planted every year and crop residue is left on the surface of the soils, terraces may not be needed. A desirable cropping system includes crops that produce a large amount of residue and deep-rooted plants, because plants of this type help reduce erosion and overcome problems of compaction.

These soils are also suited to pasture. King Ranch bluestem, johnsongrass, and bermudagrass do well.

CAPABILITY UNIT IIe–2

This unit consists of moderately deep to deep, gently sloping, clay soils. These soils have very slowly permeable clay lower layers that hinder the movement of water and air and the growth of plant roots. Water enters the soil readily through surface cracks caused by drying, but water enters very slowly after the cracks close. Because these soils are gently sloping, they are moderately susceptible to erosion. They have a high available water capacity. These soils are difficult to keep in good tilth because of the narrow range of moisture content within which they can be safely cultivated.

Most areas of these soils are cultivated. Small grain, sorghum, and cotton are the principal crops.

A cropping system that controls erosion, conserves moisture, and maintains good soil structure is needed. If these soils are planted to row crops, terraces, waterways, and contour tillage are needed.

Pastures do well on these soils. Suitable adapted grasses are johnsongrass and King Ranch bluestem. Legumes suitable for pasture are sweetclover, alfalfa, and buttonclover.

CAPABILITY UNIT IIe–3

This unit consists of deep to moderately deep soils of the uplands. These soils have a fine sandy loam surface layer and moderately, moderately slowly, and slowly permeable lower layers. These nearly level to gently sloping soils are moderately susceptible to erosion and have a moderate to high available water capacity.

Many areas of these soils are cultivated. Peanuts, small grain, and sorghum are the main crops. Cool-season legumes, such as vetch and winter peas, do well on these soils. Orchards also are well suited.

A cropping system that controls erosion, maintains soil structure, and conserves moisture is needed. When soils

[2] By George Desha, management agronomist, and Billy J. Wagner, soil scientist, Soil Conservation Service.

are planted to row crops, terraces, waterways, and contour tillage are needed.

Some areas of these soils are used for tame pasture. Adapted grasses that do well are bermudagrass, johnsongrass, King Ranch bluestem, and weeping lovegrass.

CAPABILITY UNIT IIs-1

This unit consists of deep, calcareous, nearly level, clayey soils. These soils have slowly to very slowly permeable lower layers that hinder the movement of water and air and the growth of plant roots. Runoff is slow to very slow, and the soils take in water readily through surface cracks caused by drying. These soils have a high available water capacity. The narrow range of moisture content at which these soils can be cultivated makes good structure and tilth difficult to maintain.

Most areas of these soils are cultivated. The main crops are small grain, sorghum, and cotton. Some alfalfa is grown, and sweetclover also is suited to these soils.

A cropping system that conserves moisture and maintains soil structure is needed.

Pasture is a good alternate use for these soils. Suitable adapted grasses are johnsongrass and King Ranch bluestem.

CAPABILITY UNIT IIs-2

This unit consists of deep nearly level to gently sloping soils. These soils have a fine sandy loam surface layer and very slowly permeable clay lower layers. The clay lower layers hinder the movement of water, air, and plant roots. Erosion is slight. Runoff is slow, and these soils have a high available water capacity.

Most areas are planted to small grain and sorghum for grazing. Cool-season crops are well suited to these soils.

A cropping system that conserves moisture and maintains soil structure is needed.

Pasture is an alternate use for these soils. Among the adapted grasses in use are King Ranch bluestem and johnsongrass. Legumes, such as vetch and buttonclover, are also suitable for pasture, and many areas are in native grasses.

CAPABILITY UNIT IIIe-1

This unit consists of moderately deep to deep gently sloping soils on uplands and stream terraces. These soils have a loam, clay loam, or silty clay surface layer and slowly to moderately permeable lower layers. The available water capacity is moderate to high.

Most cultivated areas are planted in small grain and sorghum. These soils are best suited to cool-season crops that mature early.

A cropping system that conserves moisture, controls erosion, and maintains soil structure is needed. Among the management practices needed for row crops are terracing, contour farming, and grassing of waterways.

These soils are also suited to pasture. Some adapted grasses now in use are King Ranch bluestem, johnsongrass, and bermudagrass. Buttonclover and sweetclover are legumes that do well on these soils.

CAPABILITY UNIT IIIe-2

This unit is made up of moderately deep to deep, moderately well drained to well drained soils on uplands. Most areas of these soils are damaged by erosion. In eroded areas, the surface layer ranges from loamy fine sand to sandy clay loam. The lower layers are moderately, moderately slowly, and slowly permeable. Rills, shallow gullies, and thin spots are common. These soils have a moderate to high available water capacity.

Most areas of this unit are cultivated. Sorghum, small grain, and peanuts are the principal crops. Orchards also are suited to these soils.

A cropping system that helps control erosion, conserve moisture, and maintain soil structure is needed. Terraces, waterways, and contour farming are essential where row crops are grown.

Pasture and hay also grow well on these soils. Adapted pasture and hay plants are bermudagrass, johnsongrass, weeping lovegrass, and King Ranch bluestem. Legumes suitable for pasture are vetch and winter peas.

CAPABILITY UNIT IIIe-3

This unit consists of moderately deep to deep, gently sloping to sloping, sandy soils on uplands. The surface layer ranges from loamy very fine sand to fine sand. Permeability is moderate to moderately slow and slow. Water erosion and soil blowing make cultivation hazardous. The available water capacity is moderate to high. The permeable surface layer is able to make efficient use of small rains, and the soils give up moisture readily to plants.

Most areas of these soils are cultivated. Peanuts, small grain, and sorghum are the principal crops. Orchards also are well suited to these soils.

A cropping system that controls erosion, conserves moisture, and improves fertility is needed (fig. 20). Effective management practices are use of crop residue, fertilization, cover crops, soil-improving crops, and wind stripcropping. Litter from crops such as sorghums that is maintained on the surface of the soil protects growing crops and gives effective erosion control.

Pasture is a good alternate use for these soils. Adapted grasses suitable for these soils are bermudagrass and weeping lovegrass.

CAPABILITY UNIT IIIe-4

This unit consists of deep, well drained and moderately well drained, nearly level to undulating soils of

Figure 20.—**Peanuts and wind strips of sudangrass on Selden soil.**

the sandy uplands. These soils have a loose fine sand to loamy sand surface layer and moderately slowly permeable lower layers. Soil blowing is a problem on these soils. They have a moderate available water capacity, and plants make effective use of small rains. A temporary water table, perched on the more clayey lower layers, is created following periods of heavy rainfall.

Most areas of these soils are planted in peanuts and sorghum. Some cotton and small grain are grown, and orchards are also suited to these soils.

A cropping system that controls erosion, conserves moisture, and improves fertility is needed (fig. 21). Some effective management practices are crop residue use, soil improving crops, cover crops, fertilization, and wind stripcropping. Crop residue maintained on the soil surface protects growing crops and gives effective erosion control.

Pasture is an alternate use for these soils. Bermudagrass and weeping lovegrass are suitable adapted grasses.

CAPABILITY UNIT IIIe-5

This unit consists of shallow gently sloping soils on uplands. These soils have a loam to clay surface layer. Erosion is a slight to moderate hazard. Shallowness to rock restricts root growth, and the soils have a low available water capacity.

Many areas of these soils are cultivated. Small grain, cotton, and sorghum are the main crops. These soils are suited to shallow-rooted, cool-season plants.

A cropping system that conserves moisture, controls erosion, and improves soil structure and fertility is needed. Among the effective management practices are use of crop residue and use of cover crops and of fertilizer. Terraces, waterways, and contour farming are needed on fields that are used for row crops.

Pasture is another suitable use for areas of this unit. Two forage grasses adapted to the area are King Ranch bluestem and johnsongrass.

Figure 21.—**Wind erosion on unprotected peanut field of Nimrod soil.**

CAPABILITY UNIT IIIe-6

This unit is made up of deep and moderately deep, nearly level to gently sloping soils on uplands. These soils have a fine sandy loam to clay loam surface layer and dense, very slowly and slowly permeable clay lower layers. Surface layers crust and harden after rains and are difficult to keep in good tilth. The clay lower layers hinder the movement of water, air, and plant roots. Erosion is a moderate hazard when these soils are cultivated. The available water capacity is moderate to high.

Most areas of this unit are in grass. A few areas are cultivated to small grain and forage crops. Cool-season crops, such as small grain and legumes, grow well on these soils.

A cropping system that conserves moisture, controls erosion, and maintains fertility and soil structure is needed. Effective management requires use of crop residue, cover crops, fertilization, terraces, contour farming, and grassed waterways.

These soils can be utilized for pasture. Grasses that do well are King Ranch bluestem and johnsongrass. Legumes suitable for pasture are vetch and buttonclover.

CAPABILITY UNIT IVe-1

This unit is made up of moderately deep to deep soils that are gently sloping and eroded. These soils have a calcareous loam to clay loam surface layer and moderately to moderately slowly permeable lower layers. Small gullies and thin spots are common.

These soils are best suited to grass, and many areas are in native grasses. A few areas are used for crops of small grain and sorghum.

A cropping system that controls erosion, conserves moisture, and improves fertility is needed. The soils are so steep that terraces generally are not suitable.

Pasture forage production can be increased by seeding adapted grasses, such as King Ranch bluestem and johnsongrass. Suitable legumes for pastures are buttonclover and sweetclover.

CAPABILITY UNIT IVe-2

The one soil in this unit, Purves clay, 3 to 5 percent slopes, is only about 16 inches thick and is underlain by hard limestone. The surface layer is calcareous. Runoff is slow to moderate, and the soil has a low available water capacity. Shallow soil depth restricts the root zone. Cultivated areas are subject to erosion because of the slope. Where the surface layer is thinner, the limestone bedrock crops out.

Most areas of this soil are in native grass. Other areas are used to grow small grain and sorghum.

A cropping system that conserves moisture, controls erosion, and increases fertility is needed. A system that keeps drilled crops or grasses on the soil year after year is effective.

This soil is best suited to pasture. Increased forage production is possible through use of adapted grasses, such as King Ranch bluestem and johnsongrass, and legumes, such as sweetclover and buttonclover.

CAPABILITY UNIT IVe-3

This unit consists of Waurika fine sandy loam, 1 to 3 percent slopes, eroded. This deep soil has a thin crusty

surface layer and compact, very slowly permeable, clay lower layers. The clayey lower layers restrict the movement of water and air and the growth of plant roots. Much of the surface layer has been removed by erosion. Rills, small gullies, and thin spots are common.

Most areas of this soil are in native grasses. A few areas are in crops of small grain, sorghum, and cotton.

A cropping system that conserves moisture, controls erosion, and improves the structure of the surface layer is needed. A system that keeps small grain, sorghum, or a similar drilled crop on the soil every year is effective. Terraces that keep runoff water from concentrating in rills and gullies are also effective.

This soil is best suited to pasture. Adapted pasture grasses, such as King Ranch bluestem and johnsongrass, increase forage production.

CAPABILITY UNIT IVe-4

This unit consists of moderately deep to deep gently sloping and rolling soils on uplands. These soils have a fine sandy loam surface layer but lower layers range from sandy clay loam to loamy very fine sand and from moderately to moderately slowly permeable. The available water capacity is high. The risk of erosion is severe when soils are cultivated.

These soils are best suited to grass, and most areas are in native grass. Some areas are used for growing small grain and sorghum.

A cropping system that conserves moisture, controls erosion, and maintains structure of the surface soil is needed. A system that keeps small grain, sorghum, or a similar drilled crop on the soils year after year is effective.

Tame pasture is a better use of these soils than either native range or crops. King Ranch bluestem and johnsongrass are adapted grasses than can be used to increase forage production on areas used for pasture.

CAPABILITY UNIT IVe-5

This unit consists of moderately deep to deep, gently sloping to sloping, eroded, sandy soils on uplands. These soils have a thin surface layer that ranges from fine sand to sandy clay loam. Plowing has mixed the thin eroded surface layer and lower layers. The lower layers are slowly to moderately slowly permeable. The available water capacity is high. These soils are subject to water erosion and soil blowing.

Most areas of this unit are cultivated. Small grain, sorghum, and peanuts are the principal crops. Many areas that were formerly cultivated have been returned to grass.

A cropping system that controls erosion, conserves moisture, and improves fertility is needed. A system utilizing cover crops, fertilization, terracing, and crop-residue management is effective.

Pasture is the best use of these soils. Adapted grasses, such as bermudagrass, King Ranch bluestem, and weeping lovegrass, do well on these soils. Legumes suitable for pasture are vetch and winter peas.

CAPABILITY UNIT IVe-6

This unit consists of the deep undulating Nimrod-Arenosa-Patilo fine sands, 0 to 3 percent slopes. These are loose sandy soils of the uplands. They have a thick fine sand surface layer. Nimrod and Patilo soils have mottled sandy clay loam lower layers. Arenosa soils have a fine sand profile that extends deeper than 80 inches. The hazard of soil blowing is high on these soils, and the available water capacity is low to moderate.

Most areas of this unit are covered by thick scrub oak timber and native grasses. A few areas are planted in peanuts, watermelons, and sorghum.

A cropping system that controls soil blowing, conserves moisture, and maintains fertility is needed. Wind stripcropping, growing of cover crops, fertilization, and good management of crop residue are effective management practices.

Pasture is the most suitable use for these soils. Grasses that grow well are Coastal bermudagrass and weeping lovegrass.

CAPABILITY UNIT Vw-1

This unit consists of deep, nearly level, frequently flooded soils on the flood plain of streams. These soils have a surface layer of variable texture and stratified, moderately to moderately slowly permeable lower layers. They are flooded more often than once in 4 years.

Most areas of these soils are in bermudagrass and johnsongrass pasture or in trees. Pecan trees are adapted to most of these soils.

These soils need a permanent cover of plants that tolerate flooding and wetness. Pasture grasses that grow well on these soils are bermudagrass and johnsongrass. Suitable legumes for pasture are vetch and buttonclover.

CAPABILITY UNIT VIe-1

This unit consists of deep, gently sloping to moderately steep, eroded and severely eroded soils. These soils have a clay loam to fine sandy loam surface layer and moderately permeable lower layers. The available water capacity is high. Erosion has removed most of the surface layer, and the lower layer is exposed in many places. Rills, thin spots, and uncrossable gullies are common.

Most areas of these soils are in native range. Some areas were farmed at one time but now are in pasture.

These soils are best suited to grass. Their main need is a plant cover to control erosion. Grazing should be controlled to insure enough grass height to keep plants vigorous.

CAPABILITY UNIT VIe-2

This unit consists of moderately deep to deep, gently sloping to sloping, severely eroded soils on uplands. The eroded surface layer is thin and variable in texture. The lower layers range from moderately to moderately slowly permeable. Available water capacity is high. Water erosion is severe. Thin spots, rills, and uncrossable gullies are common.

These soils are too eroded for cultivation. Most areas were cultivated at one time but now are in native grasses. Many areas are covered by low quality needlegrass pasture.

Careful management is needed to control erosion. These soils are suitable for range, but grasses need to be grazed carefully to insure that plants remain vigorous.

CAPABILITY UNIT VIe-3

This unit consists of the deep, sloping to undulating Nimrod-Arenosa-Patilo fine sands, 3 to 8 percent slopes. These are loose sandy soils of the uplands. Their fine sand surface layer is more than 20 inches thick. Permeability of lower layers is very rapid to moderately slow. These soils are susceptible to soil blowing and have a low to moderate available water capacity.

These soils are too steep and sandy for cultivation. They are best suited to range, and most areas are used for brushy range and pasture. Thick stands of post oak and blackjack oak brush grow in many areas. Areas that have been cultivated are now mostly in grass.

Effective management practices needed are brush control and controlled grazing to keep plants vigorous. Adapted grasses, such as weeping lovegrass and bermudagrass, do well on these soils.

CAPABILITY UNIT VIe-4

This unit consists of moderately deep, gently sloping to sloping, stony soils on uplands. These soils have a loamy fine sand to loamy sand surface layer about 15 inches thick and moderately to slowly permeable lower layers. Numerous sandstone fragments occur on and in the surface layer. The soils have a moderate to high available water capacity.

Most areas of these soils are in native grass pasture. They are too stony for cultivation. A few areas have been cleared and sodded to bermudagrass.

These soils are best suited to range. Management practices that keep plants vigorous are needed.

CAPABILITY UNIT VIe-5

This unit consists of shallow to moderately deep, gently sloping to steep, stony soils of the uplands. These soils have a fine sandy loam surface layer and moderately slowly to slowly permeable clay lower layers. They have numerous sandstone fragments on the surface and in the soil profile. They have a low to moderate available water capacity.

Most areas of these soils are too stony and steep for cultivation and are in native grass. These soils are best suited to range, but careful management is needed to keep plants vigorous.

CAPABILITY UNIT VIs-1

This unit consists of shallow, nearly level to sloping, stony and gravelly soils on uplands. These soils have a loam to clay surface layer and moderately, moderately slowly, and slowly permeable lower layers that rest on hard limestone or marl. There are numerous limestone rocks and gravel size fragments on the surface and in the soil. The available water capacity is low.

These soils are best suited to range, and most areas are used for native grass pasture. These soils are too shallow and stony for cultivation. Management practices that keep plants vigorous are needed.

CAPABILITY UNIT VIIe-1

The only mapping unit in this capability unit is Gullied land. The exposed soil material is reddish sandy clay. The gullies are U-shaped and have cut into the unstable sandy substrata. The gully walls are devoid of vegetation, and many are actively eroding. These areas are susceptible to water erosion and are critical sources of silt.

The areas of this unit are suitable for very limited grazing and are usually included in surrounding range sites. These areas are not suitable for tame pasture without extensive reclamation.

Major management problems are the prevention of further erosion and the maintenance of a good cover of vegetation. The diversion of water from these areas is also helpful where there are suitable outlets. Controlled grazing helps maintain vegetation and reduce erosion.

CAPABILITY UNIT VIIe-2

This unit consists of Owens stony clay, 3 to 20 percent slopes. It is a shallow, gently sloping to steep, stony soil. This soil has a calcareous clay surface layer and very slowly permeable lower layers over layered shale. There are numerous sandstone fragments on the surface. Gullies, rills, and thin spots are common. The erosion hazard is severe to very severe, and the soil has a low available water capacity.

This soil is used for native grass range. Areas are too steep and stony for cultivation. Management practices that keep plants vigorous are needed.

CAPABILITY UNIT VIIs-1

This unit consists of very shallow to moderately deep, gently sloping to steep, calcareous soils. These soils have a stony to very gravelly clay loam surface layer and moderately to slowly permeable lower layers. Stone and gravel are scattered throughout the soils. Shallow soil depth and coarse fragment content restrict root development. The available water capacity is low.

The soils of this unit are best suited to range and are used for range. They are too shallow and stony for cultivation.

Estimated Yields

Crop yields in Erath County under dryland farming depend largely on the available moisture supply at planting time and during the growing season. Generally, the higher the rainfall, the higher the crop yields. Some of the sandier soils may also be limited by fertility. Consistent high yields depend on good soil management in addition to available moisture and fertility. The soil that is used within its capabilities and managed according to its needs will produce the best average yields. Such management includes the use, where needed, of terrace systems, contour farming, soil-improving crops, cover crops, wind stripcropping, crops that produce a large amount of residue, and timely application of the right amounts and kinds of fertilizer.

Average yield estimates are listed in table 2 for each major cultivated soil in Erath County. Estimated average yields are given for a high level of management for peanuts, grain sorghum, and oats. Also listed are estimated animal-unit-months of grazing for tame pastures. These yields are based on information from research, from interviews with Texas Agricultural Experiment Station personnel, and from interviews with farmers and others having knowledge of yield information. Soils not

TABLE 2.—*Estimated average acre yields of principal crops under a high level of management*

[Only the arable soils are listed in this table. Dashes in a column indicate that the crop is not ordinarily grown on the soil]

Soil	Peanuts	Grain sorghum	Oats	Tame pasture
	Lbs.	*Lbs.*	*Bu.*	*A.U.M.*[1]
Altoga-Lewisville clay loams, 5 to 8 percent slopes, eroded	----------	1, 800	35	4. 0
Blanket clay loam, 0 to 1 percent slopes	----------	3, 500	55	7. 0
Blanket clay loam, 1 to 3 percent slopes	----------	3, 000	50	6. 5
Bolar clay loam, 3 to 5 percent slopes, eroded	----------	2, 000	37	5. 0
Bolar-Denton complex, 3 to 5 percent slopes	----------	2, 500	45	6. 0
Bosque loam, occasionally flooded	1, 100	3, 500	60	8. 0
Bunyan fine sandy loam, occasionally flooded	1, 150	3, 500	60	8. 0
Bunyan soils, frequently flooded	----------	----------	----------	9. 0
Chaney loamy sand, 1 to 5 percent slopes	1, 200	2, 400	38	4. 0
Chaney soils, 1 to 5 percent slopes, eroded	900	1, 850	34	5. 0
Crawford clay, 1 to 3 percent slopes	----------	2, 500	50	6. 0
Demona loamy sand, 0 to 5 percent slopes	1, 300	2, 100	20	4. 5
Denton silty clay, 1 to 3 percent slopes	----------	2, 700	50	6. 5
Duffau fine sandy loam, 0 to 1 percent slopes	1, 300	3, 000	40	6. 5
Duffau fine sandy loam, 1 to 3 percent slopes	1, 800	2, 700	40	6. 5
Duffau fine sandy loam, 3 to 5 percent slopes	1, 100	2, 500	38	5. 5
Duffau loamy fine sand, 0 to 5 percent slopes	1, 200	2, 100	38	4. 0
Duffau soils, 2 to 5 percent slopes, eroded	1, 000	2, 500	35	5. 0
Duffau soils, 5 to 8 percent slopes	800	2, 000	30	4. 5
Frio clay loam, occasionally flooded	----------	3, 500	60	8. 0
Gowen clay loam, occasionally flooded	----------	3, 500	60	8. 0
Hensley loam, 1 to 3 percent slopes	----------	2, 200	40	5. 0
Houston Black clay, 0 to 1 percent slopes	----------	3, 000	55	6. 5
Houston Black clay, 1 to 3 percent slopes	----------	2, 700	50	6. 5
Lamar loam, 1 to 3 percent slopes	----------	2, 000	35	5. 0
Lamar loam, 3 to 5 percent slopes	----------	1, 500	25	4. 5
Lewisville clay loam, 1 to 3 percent slopes	----------	2, 700	50	6. 5
Lewisville clay loam, 3 to 5 percent slopes	----------	2, 500	45	6. 0
Lewisville-Altoga clay loams, 3 to 5 percent slopes, eroded	----------	2, 000	40	5. 0
Lindy fine sandy loam, 1 to 3 percent slopes	----------	2, 700	45	6. 5
Lindy fine sandy loam, 1 to 3 percent slopes, eroded	----------	2, 000	35	5. 5
Lindy loam, 1 to 3 percent slopes	----------	2, 500	50	6. 0
May fine sandy loam, 0 to 1 percent slopes	1, 300	3, 000	45	7. 0
May fine sandy loam, 1 to 3 percent slopes	1, 200	2, 700	40	6. 5
Nimrod fine sand, 0 to 5 percent slopes	1, 150	2, 000	18	4. 5
Nimrod-Arenosa-Patilo fine sands, 0 to 3 percent slopes	800	1, 200	18	3. 5
Purves clay, 1 to 3 percent slopes	----------	2, 200	40	5. 0
Purves clay, 3 to 5 percent slopes	----------	2, 100	38	4. 8
Sandy alluvial land	----------	----------	----------	8. 0
Selden fine sand, 1 to 5 percent slopes	1, 200	2, 200	30	3. 5
Selden soils, 1 to 5 percent slopes, eroded	800	1, 600	20	5. 0
Thurber and Waurika soils	----------	1, 400	35	4. 0
Trinity clay, occasionally flooded	----------	3, 500	60	7. 0
Truce fine sandy loam, 1 to 5 percent slopes	----------	2, 000	30	3. 5
Vashti loamy fine sand, 1 to 3 percent slopes	----------	----------	----------	6. 0
Venus loam, 0 to 1 percent slopes, occasionally flooded	1, 000	3, 000	60	7. 0
Venus loam, 1 to 3 percent slopes	900	2, 700	50	6. 0
Venus loam, 3 to 5 percent slopes	800	2, 300	40	5. 5
Waurika fine sandy loam, 0 to 1 percent slopes	----------	2, 000	35	5. 0
Waurika fine sandy loam, 1 to 3 percent slopes	----------	1, 500	30	4. 0
Waurika fine sandy loam, 1 to 3 percent slopes, eroded	----------	1, 350	25	3. 5
Waurika fine sandy loam, thick surface, 0 to 2 percent slopes	----------	2, 500	40	6. 0
Windthorst loamy very fine sand, 1 to 5 percent slopes	1, 290	2, 000	35	5. 0
Windthorst fine sandy loam, 1 to 3 percent slopes	1, 020	2, 500	38	6. 5
Windthorst fine sandy loam, 1 to 3 percent slopes, eroded	1, 000	2, 250	35	5. 0
Windthorst fine sandy loam, 3 to 5 percent slopes	950	2, 000	35	5. 0
Windthorst fine sandy loam, 5 to 8 percent slopes	800	1, 750	25	4. 5
Windthorst soils, 3 to 5 percent slopes, eroded	800	1, 500	20	4. 0

[1] Animal-unit-month is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre, multiplied by the number of months the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 2 months of grazing for 2 cows has a carrying capacity of 4 animal-unit-months.

listed are either unsuitable for cropland or the crops listed are not generally grown on these soils.

The following management practices are common to the high level of management for the crops listed.

1. Effective measures for conservation of soil and moisture.
   a. Terraces and diversions where needed.
   b. Contour farming and wind stripcropping.
   c. Adequate measures for maintenance of tilth.
      (1) Proper management of crop residues.
      (2) Minimum tillage, and least possible disturbance of soil structure.
      (3) Crop residues left on the surface or in the surface layer.
      (4) Variation in depth of tillage.
      (5) Postponement of tillage, harvesting, or grazing if the soils are wet.
   d. Use of an effective cover crop.
2. Effective use of crops and fertilizers.
   a. Clean-tilled row crops alternated with close-growing crops.
   b. Selection of proven better varieties or strains of crops, and timely planting and harvesting.
   c. Commercial fertilizers used in the cropping system, as indicated by soil tests and crop needs.
3. Consistent and timely measures for control of insects, plant diseases, and weeds.

The following management practices are common to high levels of management for tame pastures.

1. A full cover of base grass is maintained.
2. Proper use is practiced, including rotation grazing.
3. Fertilizer is applied according to soil tests and management needs.
4. Systematic weed and brush control is practiced.
5. Mowing follows the grazing season to prevent spot grazing of new growth.

Irrigation

A limited supply of surface water storage is presently available for irrigation. It is mainly in the floodwater retarding reservoirs, built in the county's three watersheds, and in a small number of large irrigation reservoirs that have been constructed. The potential for surface water storage in most parts of the county can be developed to furnish considerably more irrigation water. All runoff water in the county is good irrigation water, since it contains very small amounts of undesirable minerals.

Ground water is available in sufficient quantities for irrigation in the central and southern parts of the county. The largest quantities are in the southern part. In the west-central part of the county, ground water is available at depths ranging from 80 to 150 feet in quantities of from 50 to 200 gallons per minute. Ground water in the central and southern parts of the county is at depths of 200 to 425 feet and in quantities of from 200 to 400 gallons per minute.

Ground water from the Trinity Sand Formation is presently being used for irrigation in Erath County and the counties adjoining on the west. The salt content of this water, however, makes its use questionable. Landowners should have a chemical analysis made of any ground water used for irrigation. In addition, a periodic soil salinity analysis is a good safeguard against salt buildup in the soil.

In general, the same crops can be grown under both irrigation and dryland farming. More intensive use of high-residue crops, legumes, fertilizers, and residue management is made possible through use of irrigation. Technicians of the Soil Conservation Service assisting the Bosque, Palo Pinto, and Upper Leon Soil and Water Conservation Districts are available to assist in designing suitable irrigation systems, planning cropping systems, and in solving other irrigation problems.

Use of Soils for Range [3]

In this section, the soils of the county are grouped into range sites that produce significantly different kinds or amounts of native plants. The table "Guide to Mapping Units" at the back of the survey lists each soil and its respective range site.

Seventy-four percent, or about 510,000 acres, of the land in the county is range. It is used for grazing by livestock and an increasing number of deer. Most of this land is gently rolling, but there are some steeper slopes in the northern and eastern parts of the county. Rangeland is in all parts of the county, in the West Cross Timbers, North Central Prairies, and Grand Prairie Land Resource Areas. The landscape is dissected by numerous small drains that flow into the Paluxy, Bosque, and Brazos Rivers.

About half of the agricultural income in the county is from rangeland. The climate is favorable for growth of range vegetation. About half of the rangeland has enough browse and weeds to make it suitable for cattle, sheep, and goats. Cattle make up about 80 percent of the total animal units grazed. Goats account for about 14 percent, and sheep the remaining 6 percent.

The first grazing by domestic livestock occurred around 1854 when the county was settled. The largest number of cattle occupied the county between 1870 and 1910. During this period of heavy grazing, the plant cover deteriorated. The higher producing grasses, such as the bluestems, indiangrass, and switchgrass, were replaced by less desirable plants and brush.

In recent years, many farmers and ranchers have adopted management practices, such as cross fencing and rotational grazing, that are designed to bring back the higher producing native grasses. In addition, in many instances, they have seeded adapted grasses, such as King Ranch bluestem, johnsongrass, and bermudagrass, that have an even higher potential forage yield than native grasses.

Vegetation, both native and adapted, is produced mainly in two definite growth periods. During the months of April, May, and June, approximately two-thirds of the growth is produced. This is a period of greatest rainfall and when temperatures are most favorable for the growth of warm-season plants. The other growth period is during

[3] Prepared by THAD B. TREW and JOE B. NORRIS, range conservationists, Soil Conservation Service.

September and October. Rainfall is not so great or so dependable during this season. Cooler temperatures the last part of October retard the growth of the warm-season grasses. Texas wintergrass, abundant on all sites except sands, creates a desirable balance between summer and winter forage. Growth is limited during January because temperatures are low. Short droughts are common in midsummer, and some droughts may last 60 to 90 days. These retard plant growth and prevent the spread of desirable vegetation.

Range sites and condition classes

Different kinds of soil vary in their capacity to produce grass and other plants for grazing. The soils that produce about the same kind and amount of forage, if the range is in similar condition, make up what is called a range site.

Range sites are kinds of rangeland significantly different in the kinds and amounts of vegetation they produce. A significant difference in vegetation is a difference that is great enough to require separate grazing of the range site or different management to maintain or improve the vegetation on the site. If cultivated crops are not to be grown, the most productive group of forage plants on a range site is generally the original combination of plants. On many acres in this county the present potential of the range is considerably less than the original potential. Erosion and continuous overgrazing are the principal causes for this loss in productivity.

Range condition is determined by the proportions of *decreaser*, *increaser*, and *invader* plants currently on a range site.

Decreasers are species in the potential plant community that decrease in relative amount under close grazing. They generally are the tallest and most productive perennial grasses and forbs and the most palatable to livestock.

Increasers are species that increase in relative amount as the more desirable plants are reduced by close grazing. They are commonly shorter, and some are less palatable to livestock than decreasers.

Invaders are plants that were kept out of the original stand by the competition for moisture, nutrients, and light in the potential plant community. They do, however, come into the stand and grow along with the increasers after the original vegetation has been reduced by grazing. Invaders are poor quality grasses, annual weeds, and some shrubs. Generally they have little grazing value.

Range condition classes show the present condition of the native vegetation on a range site in relation to the native vegetation that could grow on the site.

A range is in *excellent condition* if 76 to 100 percent of the vegetation is of the same kind as in the original stand. It is in *good condition* if the percentage is between 51 and 75, in *fair condition* if the percentage is between 26 and 50, and in *poor condition* if the percentage is less than 25.

Potential forage production depends on the range site. Current forage production depends upon the range condition and the moisture that the plants get during their growing season. One of the main objectives of good range management is to keep rangeland in *excellent* or *good condition*.

When range is maintained in excellent or good condition, water is conserved, yields are improved, and the soils are protected. A major problem is recognizing important changes in the kind of cover on a range site. Changes take place gradually and can be misinterpreted or overlooked. Growth encouraged by heavy rainfall may lead to the conclusion that the range is in good condition, when actually the cover is weedy and the long-time trend is toward lower production. On the other hand, some rangeland that has been closely grazed for relatively short periods, under the supervision of a careful manager, may have a degraded appearance that temporarily conceals its quality and ability to recover.

Descriptions of range sites

The 12 range sites in Erath County are described in the following pages. Two miscellaneous land types, Gullied land and Mine dumps, do not have the ability to produce any appreciable amount of vegetative growth and have not been assigned to range sites.

Range site descriptions provide a brief resume of the site. They include recognizable characteristics of the site, site hazards, potential vegetation, and yield. Yield is expressed as a range in production from unfavorable to favorable years.

ROLLING PRAIRIE RANGE SITE

Soils of this range site form a gently sloping to steep prairie landscape dotted by a few scattered live oaks. In many places very shallow and moderately deep soils occur alternately and give this site a benched appearance.

Some of the shallow and very shallow areas are droughty and low in productivity. Other areas produce a good growth of mid grasses because the roots can draw moisture from the underlying soil material. Small limestone rocks on the surface and throughout the soils improve the moisture supply in the area around the rocks. The soils of this site crust if their surface is left bare. The high lime content causes forage to be low in phosphorus during winter and in dry periods.

The potential plant community on this range site consists of mid and a few tall grasses. Decreasers make up about 70 percent of the vegetation. Little bluestem is the principal decreaser and accounts for 50 percent or more of the vegetation. Other decreasers are indiangrass and big bluestem. Increasers, mainly side-oats grama, tall grama, and silver bluestem, make up the remaining 30 percent of the vegetation.

For several years the range condition on most soils in this site has been declining. Overuse by livestock has left most range in fair to poor condition. Little bluestem, big bluestem, and indiangrass are the first decreasers to disappear as a result of overgrazing by cattle. In some instances, heavy grazing by goats and sheep has reduced or eliminated the most desirable forbs.

This site is a good forage producer and responds readily to sound range management, including seeding. When this site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 4,500 in dry years to 5,000 in wet years. About two-thirds of this yield is suitable forage for livestock.

SANDY LOAM RANGE SITE

The nearly level to sloping soils of this range site occupy post oak and blackjack oak savannahs on hills (fig. 22). These soils are shallow, moderately deep, and deep sandy loams that have clay, sandy clay, or sandy clay loam lower layers. The soils of this site have a good moisture relationship, and plants are able to make good use of small showers. The soils store moisture in the lower layers and are good grass producers. Grass roots easily penetrate these soils, but if they are left without vegetation, they crust and water intake is retarded. These soils have a good mineral balance, and the vegetation produced on this site is palatable and nutritious to livestock. These soils are susceptible to both soil blowing and water erosion.

The original stand of post oak shaded about 15 percent of the acreage of these soils, and a good stand of mid and a few tall grasses grew in the open areas. Decreasers still make up about 75 percent of the plant community. In some places the principal decreaser, little bluestem, covers more than 50 percent of the site. Indiangrass, and to less extent big bluestem and switchgrass, thrive on the wetter parts of the site. Increasers, such as silver bluestem and side-oats grama, make up 25 percent of the grass cover. Overgrazing permits oaks to increase to the point where they are dominant on the site.

Forage on this site is preferred to that on the sandy and deep sandy sites commonly found in the same pasture. Thus, it is one of the first to degenerate under heavy grazing. Little bluestem and other decreasers are quickly grazed from the site. Many years ago fires helped to limit the amount of oak. Now, with control of fires and reduced competition by grass, much of the site is covered by oak.

This site responds readily to range management. Brush control and range seeding are generally needed to restore the site. Thereafter, good management can maintain production. Where this site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 4,500 in dry years to 6,000 in wet years. Three-fourths of this yield is suitable forage for livestock.

DEEP UPLAND RANGE SITE

The nearly level to moderately steep soils of this site occupy smooth prairies, valleys, and the lower part of long gentle slopes. These are deep loamy to clayey soils that can produce large amounts of high-quality forage (fig. 23). Where this site occupies a low position on the landscape, it receives additional water from adjacent slopes or wet weather seeps from limestone outcrops. This causes additional forage production. Soil crusting is seldom a problem on this site, unless the site is subjected to very heavy grazing.

Decreasers make up about 80 percent of the potential plant community. The most important are indiangrass, switchgrass, big bluestem, and little bluestem. Side-oats grama, silver bluestem, and Texas wintergrass are the principal increasers, and they make up about 20 percent of the vegetation. A few elm trees grow along some of

***Figure 22.*—Sandy Loam range site. The soils are Truce and Bonti.**

the larger streams. There are no other trees natural to the site.

This site is among the first to degenerate from continued heavy grazing. The tall grasses are quickly grazed from the site, and this leaves the shorter side-oats grama, Texas wintergrass, and buffalograss. Outside water helps to maintain these grasses, even though they may receive constant grazing. Grasses on this site have a good mineral balance.

Accessibility and the lower elevation of this site cause livestock to concentrate here during winter for protection from the weather. The site produces an abundance of Texas wintergrass in the lower condition classes.

Where the site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 6,500 in dry years to 8,000 in wet years. Approximately 5,000 to 6,000 pounds per acre is forage for livestock.

LIMESTONE HILLS RANGE SITE

The sloping to steep soils of this site occupy hills. These soils grow mid and tall grasses and scattered stands of live oak. Rocks ranging from 1 inch to 3 feet in diameter cover 30 to 40 percent of the surface on some of the slopes. The rocks permit light rains to be more effective and create a better condition for plant growth. These soils are shallow and underlain by fractured limestone and marl. The marl or clay under the limestone stores moisture that is then available to plants.

Live oak originally shaded 5 to 10 percent of this site. The decreasers that cover 75 percent of the site are little bluestem, indiangrass, and big bluestem. Increasers that make up 25 percent of the vegetation are side-oats grama, Texas cupgrass, silver bluestem, Texas wintergrass, and tall grama.

This site normally is in better condition than most of the other range sites, and sizeable acreages are in good condition. The steep slopes and stones on the surface cause livestock to graze adjacent sites that are more accessible. The number and size of stones also give protection to decreaser grasses and reduce the effects of heavy grazing and drought. Many of the decreasers, such as little bluestem and indiangrass, remain on the site and spread rapidly under good range management. This site is often invaded by cedar, but it responds well when the brush is controlled. All of the soils in this site respond well to brush control.

Where this site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 5,000 in dry years to 6,000 in wet years. Some 4,000 to 5,000 pounds per acre is forage for livestock.

BOTTOMLAND RANGE SITE

The level to gently undulating soils of this site lie along the rivers and small streams. The soils are deep and fertile. Permeability is moderate to very slow. These are

***Figure 23.*—Deep Upland range site. The soil is Houston Black clay.**

productive soils that receive extra water from frequent to occasional floods.

The original grasses are hard to find on this site because they have been grazed out by livestock and wild game. The pecan trees and a few elms and oaks that originally shaded about 10 percent of the area now shade a larger percentage of the site.

In the potential plant community, decreasers cover about 75 percent of the site. The principal ones are indiangrass, big bluestem, and switchgrass. Increasers that grow on the other 25 percent are silver bluestem, side-oats grama, and vine-mesquite.

This productive tall-grass site is normally in poor condition on most ranches as a result of continued overgrazing. It is accessible to livestock and, in many instances, streams flow through the site. Vegetation greens up quickly and stays green longer than on most sites because extra water is received. It also produces a better than average balance of summer and winter forage. These factors encourage the heavy livestock grazing the site receives. The taller grasses have been replaced by Texas wintergrass and Canada wildrye. Pecan, elm, and hackberry trees have increased in number since livestock have overgrazed the site. Because the site receives extra water, it responds well to brush control, reseeding, and other good practices of range management.

Where the site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 7,000 in dry years to 8,500 in wet years. About 5,500 to 6,000 pounds per acre is forage for livestock.

SANDSTONE HILLS RANGE SITE

The soils of this site occupy low hills that have sandstone rocks and open stands of post oak trees on the slopes. The soils are moderately deep stony sandy loam.

About 10 to 45 percent of the area is covered by sandstone rocks (fig. 24). The rocks range from 1 inch to 5 feet in diameter. Soils of this site make effective use of small showers, and plants survive well during periods of drought.

The original vegetation on this site was an open stand of post oak trees that shaded about 15 percent of the ground and mid and tall grasses under and around the trees. The main decreasers, which still cover about 70 percent of the site, are little bluestem and indiangrass. Important increasers that cover the other 30 percent are side-oats grama, silver bluestem, and hairy grama.

The steep and stony slopes of this site have helped prevent degeneration of the vegetation. Livestock do not heavily graze the area if smoother land is available. Loss of plants from this site during a drought is not so great as on other sites, because of the water-concentrating effect of the stones.

Where the site is heavily grazed, post oak increases and shades out the grass. Response to brush control is good, however, and after a few years of effective range management, little bluestem again is dominant on the site.

Where the site is in excellent condition, the potential yield of air-dry herbage, in pounds per acre, ranges from 3,000 in dry years to 4,500 in wet years. Two-thirds of this yield is forage for livestock.

Figure 24.—**Sandstone Hills range site. The soil is Truce stony fine sandy loam, 5 to 40 percent slopes.**

SANDY RANGE SITE

The nearly level to sloping soils of this range site occupy post oak and blackjack oak savannahs. These soils are moderately deep to deep and have a sandy surface layer. They take water readily and store fairly large amounts in their sandy clay or sandy clay loam lower layers. These soils are subject to soil blowing and water erosion if left without a cover of vegetation. The forage produced on this site has a low nutritive value.

Post oak and blackjack oak originally shaded about 20 percent of this site. Continuous invasion of oaks has increased the amount of shade throughout the site. Mid and tall grasses grow among the trees. Eighty percent of these grasses are decreasers. The most important ones are little bluestem, indiangrass, and sand lovegrass. The other 20 percent are increasers, mainly silver bluestem and hairy dropseed. Under continuous overgazing, oaks and greenbriar increase and control the site.

Over the years this site has managed to maintain a fair to good stand of decreasers. Poor palatability caused by low protein and mineral content is the reason these species have remained. Brush and shrubs have invaded following years of dry weather and overgrazing. The thick stands of noxious brush have suppressed the growth of decreasers. Elimination of brush releases moisture and light to small weakened grass plants. Desirable plants respond favorably to brush control, and rapid recovery of the site can be expected.

When this site is in excellent condition, the potential annual yield of air-dry herbage, in pounds per acre, ranges from 4,000 in dry years to 5,000 in wet years. Two-thirds of this yield is forage for livestock.

SHALY HILLS RANGE SITE

The gently sloping to steep soils of this range site are on slopes of low hills (fig. 25). These shallow, grayish soils take water very slowly, crust easily, and are droughty. The underlying shale neither absorbs nor gives up much moisture to plants. Many plants that grow on this site have the ability to go dormant and then resume growth readily in response to available moisture. Erosion is a problem on much of this site.

Decreasers that make up about 60 percent of the vegetation are side-oats grama, silver bluestem, and Arizona cottontop. The principal increasers that make up the other 40 percent are curly mesquite, buffalograss, and Texas wintergrass. No trees were in the original vegetation.

This is one of the first range sites to deteriorate under adverse conditions. When the grass cover is grazed from the steep slopes, runoff is so great that erosion quickly starts. Many of the slopes are bare and severely eroded, and others support only vegetation of the type growing in deserts. Range improvement is slow because a large part of the rainfall is lost as runoff. Soil is also lost from the steep slopes, and in many instances the original vegetation cannot be restored because too much soil has been lost.

When this site is in excellent condition, the total annual yield of air-dry herbage, in pounds per acre, ranges

Figure 25.—**Shaly Hills range site invaded by mesquite. The soil is Owens stony clay.**

from 2,000 in dry years to 3,000 in wet years. Approximately one-half to two-thirds of this yield is forage for livestock.

REDLAND RANGE SITE

The nearly level to gently sloping soils of this range site are on upland savannahs. Live oak, shin oak, and a few scattered post oak trees characterize this site. The clayey and loamy soils rest on fractured bedrock. They hold a low to moderate amount of water. These soils have a good mineral balance and produce high quality palatable forage. Livestock prefer this site to all other range sites in the county. Erosion is not a problem, but crusting is severe when the surface is left bare.

Live oak or shin oak shaded about 10 to 15 percent of this site in its original state. Decreasers, mainly little bluestem, indiangrass, and big bluestem, made up 75 percent of the forage vegetation. Important increasers that made up the other 25 percent were side-oats grama, Texas wintergrass, and silver bluestem.

Because livestock prefer the palatable forage, all of the original grasses have been grazed out where they are not protected by shin oak. Following control of the oak, good management can release these grasses for fast range recovery.

When this site is in excellent condition, the total annual yield of air-dry herbage, in pounds per acre, ranges from 4,500 in dry years to 6,000 in wet years. About 4,000 to 5,500 pounds per acre is forage for livestock.

TIGHTLAND RANGE SITE

The nearly level to gently sloping soils of this range site occupy wide smooth slopes, commonly located below areas of the Shaly Hills range site. The soils of this site have slow to very slow permeability. If their cover of vegetation insures water intake, these deep to moderately deep soils can store a large amount of water that plants can use. Nevertheless, they dry out completely during periods of drought.

Many plants on this site have the ability to go dormant during dry periods and then resume growth easily when moisture becomes available. Decreasers make up about 65 percent of the potential vegetation. The most important are side-oats grama and silver bluestem. The principal increasers that cover the other 35 percent of the site are buffalograss, vine-mesquite, and Texas wintergrass.

Grass grown on this site has a good mineral balance. Palatability and easy accessibility cause livestock to prefer grazing this site to the surrounding sites. The concentrated grazing, along with periodic drought, have left most areas in poor condition (fig. 26). In addition, response to brush control and seeding is slower than on other sites. These combined adverse factors necessitate careful management.

When this site is in excellent condition, the total annual yield of air-dry herbage, in pounds per acre, ranges from 2,000 in dry years to 3,000 in wet years. About 1,500 to 2,600 pounds per acre is forage for livestock.

DEEP SANDY RANGE SITE

Areas of this range site are characterized by deep sand and thick stands of small post oak trees. These soils are deep over lower layers of fine sand and sandy clay loam. Available water capacity is low to moderate, and only deep-rooted plants grow well. Plants on this site produce low quality forage. When the surface is not protected by vegetation, soil blowing is a serious problem.

This site originally produced mostly post oak trees and little grass. At least 30 percent of the site was shaded by the post oak. Sand lovegrass is the principal decreaser, and red lovegrass in an increaser. A small amount of indiangrass has been observed on this site.

Most of this site is presently covered by a thick stand of post oak that shades from 60 to 90 percent of the soil and limits the growth of grass. Brush control is necessary before range improvement can be made. Weeping lovegrass, an introduced grass, does well when seeded after brush control.

Total annual yield of air-dry herbage is less than 1,000 pounds per acre because the soils are shaded by post oaks. Yield can be increased by controlling brush and seeding.

VERY SHALLOW RANGE SITE

The soils of this range site are gently rolling and less than 10 inches deep over nonporous shell conglomerate or limestone. Roots and water seldom penetrate the limestone and conglomerate. As a result of the limited storage of water and nutrients, the kinds and amounts of plant growth are restricted.

This is an open grassland site. Small motts of live oak shade less than 5 percent of the land. Decreasers make up about 55 percent of the potential vegetation. Little bluestem, side-oats grama, and tall grama are dominant. Another 35 percent is made up of increasers such as buffalograss and silver bluestem. About 10 percent of the vegetation is forbs.

Livestock use the low ridges in this site as a bedding ground. This complicates management and leads to further range deterioration. Most of the site is in poor condition as a result of heavy grazing and drought. Soil crusting further limits water intake. This is one of the slowest sites to recover under effective range management.

When this site is in excellent condition, the total annual yield of air-dry herbage, in pounds per acre, ranges from 1,200 in dry years to 2,000 in wet years. The site seldom produces the maximum herbage yield, but yield varies in years of unfavorable and favorable rainfall. Two-thirds of the yield is forage for livestock.

Use of Soils for Wildlife

In this section wildlife sites are described, and wildlife habitats are discussed briefly. About 74 percent of the county is in range or pasture that is well suited to wildlife. Also, much of the cultivated land is idle or is in crops that provide good habitat for wildlife.

In recent years wildlife species have been on the increase. Erath County currently supports a variety of wildlife. The more important animals are deer, raccoon, rabbit, squirrel, skunk, opossum, coyote, fox, bobcat, and armadillo. The main kinds of birds are dove, quail, duck, songbirds, and a few turkey. Largemouth bass, channel catfish, and bream are the fish generally stocked in farm ponds.

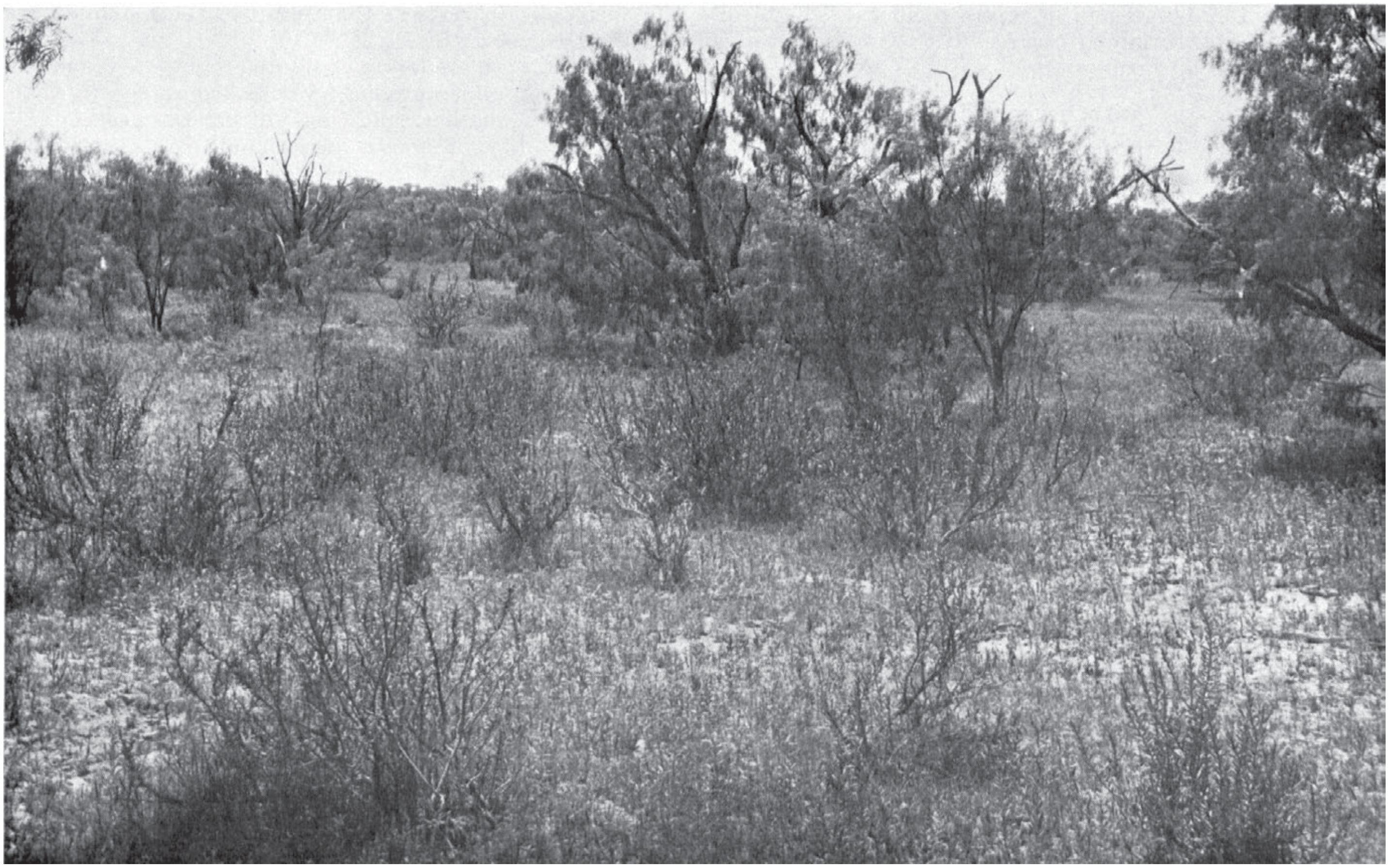


Figure 26.—**Tightland range site invaded by mesquite and tasajillo. The soil is Thurber clay loam.**

Descriptions of wildlife sites

The soils of Erath County have been placed in four wildlife sites. These sites are groups of soil associations. The soil associations are shown on the general soil map at the back of this publication and are described in the section "General Soil Map." Each site is unique in topography, productivity, kinds and amounts of vegetation, and principal species of wildlife that inhabit the site.

WILDLIFE SITE 1

This site consists of nearly level to sloping, loamy and sandy soils on uplands. The Chaney, Demona, Nimrod, Selden, Windthorst, and Duffau soils, of soil associations 1, 2, and 3 on the General Soil Map, make up this site. Chaney, Demona, Nimrod, and Selden soils occupy the sandier areas. These areas are dissected by intermittent streams.

Much of the acreage in associations 1, 2, and 3 has been farmed at one time, but many fields are now idle or in grass. The main crops grown in cultivated areas are peanuts, small grain, and grain or forage sorghum. Other areas are covered by scrub post oak and blackjack oak. The main native grasses are little bluestem, big bluestem, indiangrass, sand lovegrass, purpletop, and wildrye. Plum bushes grow in a few places.

A few deer inhabit the wooded areas. Other wildlife common to this site are squirrel, rabbit, armadillo, bobcat, fox, raccoon, coyote, and opossum. A large number of dove and quail and a few turkey inhabit this site. Songbirds are common. Migrating ducks stop to feed and rest on farm ponds.

WILDLIFE SITE 2

This site consists of nearly level to steep, loamy and clayey soils of the uplands. Most of the area consists of very shallow to moderately deep, rocky and gravelly limestone ridges and deep clayey soils in the valleys. The Houston Black, Denton, Purves, Maloterre, and Dugout soils of associations 4 and 5 make up this site. Houston Black and Denton soils occupy shallow valley areas. Purves, Maloterre, and Dugout soils occupy gravelly to stony ridges and slopes.

Much of association 4 is cultivated to small grains, cotton, and sorghum. Most of association 5 is open prairie areas of native range. The main grasses are little bluestem, big bluestem, indiangrass, switchgrass, side-oats grama, tall grama, silver bluestem, rough tridens, and Texas wintergrass. The steeper areas of association 5 have been invaded by juniper. Scattered motts of live oak grow on the level parts of association 5 and throughout association 4.

A few deer inhabit most areas of this site. The highest populations are among the steeper parts of association 5. Sparse cover limits development for deer. Other wildlife common to this site are rabbit, skunk, raccoon, bobcat,

coyote, and fox. Quail and dove are plentiful, songbirds are common, and turkey are scarce. Migrating ducks stop to feed and rest on farm ponds.

WILDLIFE SITE 3

This site consists of gently sloping to steep, loamy to clayey, stony soils. Most areas are shallow to deep soils on shale and sandstone hills and ridges. The Truce, Bonti, and Owens soils of association 6 make up this site. Truce and Bonti soils occupy ridgetops and slopes, and Owens soils lie on eroded south-facing hillsides. The areas are dissected by intermittent streams.

Most of association 6 is in wooded range. Little bluestem, sand lovegrass, Canada wildrye, purpletop, side-oats grama, buffalograss, and Texas wintergrass grow on the Truce and Bonti soils. The woody plants are mainly post oak, mesquite, and skunkbush sumac. Buffalograss, curly mesquite, vine-mesquite, silver bluestem, and Texas wintergrass grow on the Owens soils. The woody plants on Owens soils are mainly mesquite, pricklypear, and tasajillo. A few small fields along streams in valleys are planted to small grain and forage sorghum.

Some of the largest deer populations in the county are in association 6. Large populations of armadillo, rabbit, coyote, fox, opossum, squirrel, skunk, raccoon, and bobcat also inhabit this wildlife site. Quail and dove are plentiful, songbirds are common, and turkey are scarce. Migrating ducks stop to feed and rest on farm ponds in this area.

WILDLIFE SITE 4

This site consists of nearly level to gently sloping, deep, loamy soils along flood plains. The Duffau, Bunyan, Frio, Venus, and Bosque soils of associations 7 and 8 make up this site. Bunyan, Bosque, and Frio soils are adjacent to the stream channel. Duffau and Venus soils are on stream terraces a few to many feet above the flood plains. Most areas of this site are occasionally to frequently flooded.

Many of these areas are farmed to peanuts, small grain, sorghum, and cotton. The frequently flooded areas are mostly in bermudagrass pastures and pecan trees. The main native grasses are indiangrass, switchgrass, little bluestem, Canada wildrye, Texas wintergrass, and vine-mesquite. Live oak and elm also grow on this site.

Many squirrels inhabit the wooded bands along streams in associations 7 and 8. Populations are highest during the fall when pecans are plentiful. Raccoon, rabbit, fox, skunk, opossum, bobcat, and a few deer are the other kinds of animals inhabiting this site. Quail, songbirds, and a few turkey are among the species of birds on this site. The dove population is high. During migration, ducks feed along the major streams.

Wildlife habitat

Although little has been done to improve the habitat of birds and animals in the past, interest is growing for greater production of game species. The most important considerations in planning for wildlife are food, water, and cover. Detailed information on developing wildlife habitat and managing fish ponds can be obtained from technicians of the Soil Conservation Service, from the Texas Agricultural Extension Service, and from the Texas Parks and Wildlife Department. The major wildlife species and practices that improve their habitat are discussed below.

Quail and dove are the most hunted game species in the county. The number of quail varies from year to year, depending on weather conditions during the nesting season; availability of food; disease outbreaks; and adequacy of cover to provide protection from natural enemies. Numbers of both quail and dove can be increased by managing the soils to provide food, cover, and water.

Crops that provide good food for quail and dove are small grain, millet, grain sorghum, and peas. These crops do well on most tillable soils in the county.

Many native plants also supply food for quail and dove. Among these plants are annual panicum and paspalum, sunflower, ragweed, and croton. Hard-seeded grasses, such as johnsongrass, blue panic, and switchgrass, also provide food sources. All of these plants are suited to most soils in the county. Croton usually invades fields after small grain is harvested. Croton and sunflower can be encouraged in abandoned cropland or pasture areas by disking the soil in the spring. Soils such as those in associations 1, 4, 7, and 8 are well adapted to croton and sunflower. Overgrown fence rows provide good nesting areas and travel lanes.

Deer are most numerous in the northern and eastern parts of the county. These areas have many patches of trees and brush that furnish food and cover for deer. A few deer are scattered throughout the county. Their numbers can be increased by management of cover and food plantings.

Out-of-the-way fields and odd areas can be planted in small grain, grain sorghum, winterpeas, or clover for winter feed. Strips of brushland or woods provide deer with safe travel lanes and protection. The major soils of associations 1, 2, 3, and 8 are well suited to small grain, sorghum, and legumes such as vetch and winterpeas. The major soils of associations 4 and 7 are well suited to small grain, grain sorghum, and legumes such as buttonclover and alfalfa.

Turkey are scarce in Erath County, but their numbers are increasing. Millet, grain sorghum, and cowpeas are good food plants for turkey. Plantings for turkey should be located close to wooded areas and travel lanes. Roosting areas must be protected.

Squirrel, rabbit, and other small game require cover. The most important consideration in improving the habitat for these species is providing this cover. Den trees for squirrel and brush piles, briar patches, and thickets for rabbits can be left for protection. Timely control of predators may also be needed.

Fish are grown in farm ponds on most farms and ranches in Erath County. Stocking ponds with adapted species of fish, proper fertilization of fishing waters, control of pond weed and moss, and regular fishing are practices that keep the fish pond in balance and producing fish.

Use of Soils as Recreational Areas

Recreation, as an income producing enterprise, on farms and ranches is new in the county. For several years, a few landowners have leased their lands for hunting. As deer populations increase, more hunting privileges are

being leased by the day or season by individuals and groups. Creating and preserving a good habitat for wildlife is the most important consideration in expanding recreational hunting.

Scenic areas can be developed for camping, hiking, or nature study. Soil associations 5 and 6 are especially well suited to this use.

Good fishpond management stimulates interest in fishing as income producing recreation. There is a good potential for use of land in Erath County for recreation. The proximity of the Dallas and Fort Worth metropolitan areas, which have a combined population in excess of 2 million, insures a ready market for recreation enterprise.

Use of Soils for Engineering[4]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, facilities for water storage, erosion control structures, and drainage systems. Among the properties most important to the engineer are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and pH. Topography, depth to the water table, and depth to bedrock also are important.

This part of the soil survey contains information about the soils of Erath County that can be used by engineers to—

1. Make preliminary estimates of the engineering properties of soils in the planning of terraces, farm ponds, irrigation systems, and other structures for the conservation of soil and water.
2. Make preliminary evaluations of soil and ground conditions that will aid in the selection of locations for highways, airports, and pipelines and in planning detailed investigations of soils at the selected sites.
3. Locate probable sources of topsoil, sand, gravel, and other construction materials.
4. Correlate performance of engineering structures with soil mapping units and thus develop information that will be useful in designing and maintaining the structures.
5. Determine the suitability of soils for the cross-country movement of vehicles and construction equipment.
6. Supplement information obtained from other published maps, reports, and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
7. Develop other preliminary estimates for construction in a particular area.

By employing the soil map for identification of soil areas, the engineering interpretations reported in tables 3, 4, and 5 can be useful for many purposes. It should be emphasized, however, that engineering interpretations reported here do not replace the need for sampling and testing at the site of each specific construction project. Special care should be taken in gathering and evaluating soil data for engineering works involving heavy loads or excavations to greater depths than are covered in these tables. Even in these situations, the engineering data and soil map are useful in planning more detailed field investigations and for indicating the kinds of problems that may be expected.

Some of the terms used by soil scientists have a special meaning in soil science that may not be familiar to engineers. These terms are defined in the Glossary at the back of this survey.

Engineering classification systems

In table 3, the material in the horizons of a typical profile for each soil type is classified in three different systems—USDA, Unified, and AASHO. The USDA system (*7*) is the textural classification used by the United States Department of Agriculture, Soil Conservation Service. The Unified soil classification system (*9*) is used by the Department of Defense and the U.S. Army Corps of Engineers. The method approved by the American Association of State Highway Officials is commonly referred to as AASHO (*1*).

The textural classification used by the U.S. Department of Agriculture is primarily for agricultural use, but it is also important in engineering. In this system, the texture of the soil is determined according to the proportions of the different sized mineral particles. The sizes are designated as cobblestones, gravel, sand, silt, and clay. The textural classes range from the fine-textured clays, silty clays, and sandy clays to the coarse-textured loamy fine sands, loamy sands, sands, and coarse sands.

In the Unified system, soils are classified according to particle size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are 8 classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; 6 classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and 1 class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, SP or SM.

The AASHO system is used to classify soils according to those properties that affect use in highway construction. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme are soils in group A–7, clay soils that have low strength when wet and are the poorest for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, and A–7–5, A–7–6. If soil material is near a classification boundary, it is given a symbol showing both classes; for example, A–2 or A–4. Within each group, the relative engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 for the poorest. The AASHO classification for tested soils, with index numbers in parentheses, is shown in table 5; the estimated classification for all soils mapped in the survey area is given in table 3.

[4] By LERON E. SATTERWHITE, civil engineer, Soil Conservation Service.

TABLE 3.—*Estimated*

[No estimations for Gullied land, Mine dumps, and Sandy alluvial land.

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	Classification: USDA texture	Classification: Unified	Classification: AASHO
		Inches	*Inches*			
Altoga: AaD3, AdE2, AlD2. For Duffau part of AdE2, see Duffau series. For Lewisville part of AlD2, see Lewisville series.	C	>80	0–60	Clay loam	CL	A–6
Arenosa	A	>80	0–82	Fine sand	SP or SM	A–2
Blanket: BaA, BaB, BaC3	C	>80	0–14	Clay loam	CL	A–6
			14–30	Clay	CL or CH	A–7
			30–72	Clay loam	CL	A–6
Bolar: BcC2, BdC. For Denton part of BdC, see Denton series.	C	20–48	0–32	Clay loam	CL	A–6
			32–36	Clayey marl	CL	A–6
			36–44	Indurated limestone bedrock.		
Bonti: Be. For Exray part of Be, see Exray series.	C	20–40	0–8	Fine sandy loam and sandy loam.	SM	A–4
			8–30	Clay and clay loam	CL	A–6
			30–32	Sandstone.		
Bosque: Bo	B	>80	0–20	Loam	ML	A–4
			20–50	Clay loam	CL	A–6
			50–60	Clay	CL	A–6
Brackett: BrF, Bt. For Dugout part of BrF, see Dugout series. For Purves part of Bt, see Purves series.	C	[1] 10–20	0–16	Gravelly clay loam	CL or SC	A–6
			16	Soft limestone.		
Bunyan: Bu, By	B	>80	0–10	Fine sandy loam	SM or SC or ML	A–4
			10–16	Clay loam	CL	A–6
			16–62	Sandy clay loam and clay loam.	SM or SC or ML	A–4
Chaney: ChC, Cn, CoC2	C	>80	0–14	Loamy sand	SM	A–2
			14–34	Sandy clay	CL or SC	A–6
			34–40	Sandy clay loam	CL or SC	A–4
			40–72	Clay loam to shaly clay	CL or CH	A–6
Crawford: CrB	D	20–36	0–30	Clay	CH	A–7
			30	Hard limestone.		
Demona: DaC	C	>80	0–24	Loamy sand	SM	A–2
			24–48	Sandy clay	CL or SC	A–6
			48–64	Sandy clay to sandy clay loam.	CL or SC	A–6
Denton: DeB	D	30–40	0–28	Silty clay	CL	A–6
			28–32	Silty clay	CL	A–7
			32–38	Silty clay loam	CL	A–6
			38	Indurated limestone, thin.		
Duffau: DfA, DfB, DfC, DuC2, DuD, DuD3	B	>80	0–10	Fine sandy loam	SM	A–2 or A–4
			10–82	Sandy clay loam	SM or SC or CL	A–4
DlC	B	>80	0–14	Loamy fine sand	SM	A–2
			14–53	Sandy clay loam	CL or SC	A–4
			53–60	Sandy clay loam	SM or SC	A–2 or A–4

See footnotes at end of table.

properties of the soils

The symbol > means greater than. The symbol < means less than]

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)				
			Inches per hour	*Inches per inch of soil*	*pH*	
90–100	90–100	75–95	0. 63–2. 0	0. 15–0. 18	7. 9–8. 4	Moderate.
90–100	90–100	5–20	>20. 0	0. 05–0. 07	6. 0–7. 3	Low.
90–100	90–100	70–80	0. 63–2. 0	0. 15–0. 17	7. 4–7. 8	Moderate.
90–100	90–100	75–90	0. 2–0. 63	0. 15–0. 18	7. 4–8. 4	Moderate.
90–100	90–100	70–80	0. 2–0. 63	0. 15–0. 17	7. 9–8. 4	Moderate.
90–100	90–100	50–60	0. 63–2. 0	0. 14–0. 16	7. 9–8. 4	Moderate.
90–100	90–100	50–60	0. 63–2. 0	0. 12–0. 14	7. 9–8. 4	Moderate.
85–100	85–100	35–50	0. 63–2. 0	0. 10–0. 13	5. 6–6. 5	Low.
90–100	90–100	70–85	0. 2–0. 63	0. 13–0. 15	5. 6–6. 0	Moderate.
100	95–100	60–75	0. 63–2. 0	0. 15–0. 17	7. 9–8. 4	Low.
100	95–100	70–80	0. 63–2. 0	0. 15–0. 18	7. 9–8. 4	Low.
100	95–100	80–90	0. 63–2. 0	0. 17–0. 20	7. 9–8. 4	Moderate.
80–90	70–80	45–70	0. 02–0. 63	0. 10–0. 13	7. 9–8. 4	Low.
90–100	90–100	45–60	0. 63–2. 0	0. 13–0. 15	6. 6–7. 3	Low.
90–100	90–100	70–80	0. 63–2. 0	0. 15–0. 18	5. 6–6. 0	Moderate.
90–100	90–100	40–55	0. 63–2. 0	0. 15–0. 18	7. 4–8. 4	Moderate.
90–100	90–100	15–30	6. 3–20. 0	0. 08–0. 12	5. 6–6. 0	Low.
90–100	90–100	45–60	0. 06–0. 20	0. 14–0. 16	5. 6–6. 0	Moderate.
90–100	90–100	40–55	0. 2–0. 63	0. 14–0. 16	5. 6–6. 0	Moderate.
90–100	90–100	55–75	0. 06–0. 20	0. 12–0. 15	5. 6–6. 5	Moderate.
90–100	90–100	75–95	<0. 06	0. 17–0. 20	5. 6–7. 9	Very high.
90–100	90–100	15–25	6. 3–20. 0	0. 08–0. 12	6. 5–7. 3	Low.
90–100	90–100	45–60	0. 2–0. 63	0. 14–0. 16	5. 1–5. 5	Moderate.
90–100	90–100	45–55	0. 2–0. 63	0. 14–0. 16	5. 1–5. 6	Moderate.
90–100	85–100	50–60	0. 06–0. 2	0. 15–0. 18	7. 9–8. 4	Moderate.
75–100	75–100	50–60	0. 06–0. 2	0. 16–0. 18	7. 9–8. 4	High.
90–100	90–100	70–80	0. 06–0. 2	0. 15–0. 18	7. 9–8. 4	Moderate.
90–100	90–100	30–45	2. 0–6. 3	0. 10–0. 14	6. 6–7. 8	Low.
90–100	90–100	45–60	0. 63–2. 0	0. 14–0. 16	6. 1–7. 3	Low.
90–100	90–100	15–30	2. 0–6. 3	0. 08–0. 12	6. 1–7. 3	Low.
90–100	90–100	40–55	0. 63–2. 0	0. 14–0. 16	6. 1–7. 3	Low.
90–100	90–100	20–45	0. 63–2. 0	0. 14–0. 16	6. 1–7. 3	Low.

TABLE 3.—*Estimated*

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	Classification: USDA texture	Classification: Unified	Classification: AASHO
		Inches	*Inches*			
Dugout	D	10–20	0–18	Gravelly clay loam and clay loam.	CL	A–6
			18	Hard limestone.		
Exray	D	8–20	0–8	Fine sandy loam	SM	A–4
			8–16	Clay	CL	A–6
			16–24	Sandstone.		
Frio: Fr	B	>80	0–65	Clay loam and silty clay	CL	A–6
Gowen: Go	B	>80	0–30	Clay loam	CL	A–6
			30–60	Clay loam	CL	A–6
Hensley: HeB, Hn	D	12–20	0–5	Loam	CL	A–4
			5–16	Clay	CH	A–7
			16	Indurated limestone.		
Houston Black: HoA, HoB	D	>80	0–66	Clay	CH	A–7
Lamar: LaB, LaC	B	[1] 20–50	0–7	Loam	ML or CL	A–4 or A–6
			7–36	Clay loam and silty clay loam.	CL	A–6
			36–40	Clay loam (marl)	CL	A–6
Lewisville: LeB, LeC, LgC2. For Altoga part of LgC2, see Altoga series.	C	>80	0–16	Clay loam	CL	A–6
			16–42	Clay loam	CL	A–6 or A–7
			42–60	Clay loam	CL	A–6 or A–7
Lindy: LnB, LnB2, LyB	C	20–40	0–8	Loam to fine sandy loam	CL or SM	A–4
			8–28	Clay	CH	A–7
			28	Indurated limestone.		
Maloterre: Ma	D	3–12	0–8	Clay loam	CH	A–7
			8–10	Indurated shell conglomerate limestone.		
May: MfA, MfB	B	>80	0–16	Fine sandy loam	CL	A–6
			16–50	Sandy clay loam	CL	A–6
			50–60	Sandy clay loam	CL	A–6
Nimrod: NdC, NpB, NpD. For Arenosa part of NpB and NpD, see Arenosa series. For Patilo part of NpB and NpD, see Patilo series.	C	>80	0–27	Fine sand	SP or SM	A–2
			27–80	Sandy clay loam and sandy loam.	SC	A–6
Owens: OwE	D	[1] 12–20	0–16	Clay	CH	A–7
			16–28	Shaly clay	CH	A–7
Patilo	C	>80	0–50	Fine sand	SP or SM	A–2
			50–74	Sandy clay loam	SC	A–6 or A–2

See footnote at end of table.

properties of the soils—Continued

Percentage passing sieve— No. 4 (4.7 mm.)	Percentage passing sieve— No. 10 (2.0 mm.)	Percentage passing sieve— No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction	Shrink-swell potential
			Inches per hour	*Inches per inch of soil*	*pH*	
80–90	70–80	60–70	0. 2–0. 63	0. 10–0. 13	7. 9–8. 4	Low.
85–100	85–100	35–50	2. 0–4. 0	0. 10–0. 13	5. 1–7. 3	Low.
90–100	90–100	75–95	0. 2–0. 63	0. 14–0. 17	5. 6–6. 0	Moderate.
100	100	70–80	0. 2–0. 63	0. 16–0. 20	7. 9–8. 4	Moderate.
90–100	90–100	70–80	0. 63–2. 0	0. 16–0. 18	6. 6–7. 3	Moderate.
90–100	90–100	70–80	0. 63–2. 0	0. 16–0. 18	6. 6–7. 3	Moderate.
90–100	90–100	60–75	0. 63–2. 0	0. 12–0. 15	6. 6–7. 3	Moderate.
90–100	90–100	75–95	0. 06–0. 20	0. 15–0. 18	7. 4–7. 8	High.
95–100	95–100	75–100	<0. 06	0. 16–0. 20	7. 9–8. 4	Very high.
90–100	90–100	60–75	0. 63–2. 0	0. 15–0. 17	7. 9–8. 4	Moderate.
90–100	90–100	70–80	0. 63–2. 0	0. 15–0. 18	7. 9–8. 4	Moderate.
90–100	90–100	80–95	0. 63–2. 0	0. 10–0. 14	7. 9–8. 4	Moderate.
90–100	90–100	70–80	0. 63–2. 0	0. 15–0. 18	7. 9–8. 4	Moderate.
90–100	90–100	75–90	0. 63–2. 0	0. 15–0. 18	7. 9–8. 4	Moderate.
90–100	90–100	90–95	0. 63–2. 0	0. 15–0. 17	7. 9–8. 4	Moderate.
90–100	90–100	40–75	0. 63–2. 0	0. 13–0. 16	6. 1–6. 5	Low.
90–100	90–100	75–95	0. 06–0. 20	0. 15–0. 18	6. 1–6. 5	High.
90–100	90–100	70–80	0. 20–0. 63	0. 12–0. 16	7. 9–8. 4	High.
100	100	50–60	2. 0–6. 3	0. 12–0. 15	6. 6–7. 3	Low.
99–100	87–98	50–60	0. 63–2. 0	0. 12–0. 16	6. 6–8. 4	Low.
99–100	87–98	50–60	0. 63–2. 0	0. 12–0. 16	7. 9–8. 4	Low.
90–100	90–100	10–20	2. 0–6. 3	0. 05–0. 08	6. 1–7. 3	Low.
90–100	90–100	35–50	0. 20–0. 63	0. 14–0. 16	5. 5–6. 5	Low.
90–100	90–100	75–95	<0. 06	0. 13–0. 16	7. 9–8. 4	Very high.
90–100	90–100	85–95	<0. 06	0. 13–0. 15	7. 9–8. 4	Very high.
90–100	90–100	10–20	6. 3–20. 0	0. 05–0. 08	6. 1–7. 3	Low.
90–100	90–100	30–50	0. 20–0. 63	0. 14–0. 16	5. 1–5. 5	Low.

TABLE 3.—*Estimated*

Soil series and map symbols	Hydrologic group	Depth to bedrock	Depth from surface	Classification: USDA texture	Classification: Unified	Classification: AASHO
		Inches	*Inches*			
Purves: PcB, PcC, Pd. For Dugout part of Pd, see Dugout series.	D	6–20	0–16	Clay	CL or CH	A–7
			16	Indurated limestone.		
Selden: SdC, SeC2	C	>80	0–10	Fine sand	SP or SM	A–2
			10–62	Sandy clay loam	SC	A–6
Somervell: Sm. For Maloterre part of Sm, see Maloterre series.	B	20–40	0–32	Very gravelly clay loam	GC or SC	A–2
			32–36	Strongly cemented limestone bedrock.		
Thurber: Tk. For Waurika part of Tk, see Waurika series.	C	>80	0–8	Clay loam	CL	A–6
			8–62	Clay	CH	A–7
Trinity: Tn	D	>80	0–60	Clay	CH	A–7
Truce: TrC, TuF	C	20–48	0–8	Fine sandy loam	SM or ML	A–4
			8–30	Clay	CH	A–7
			30–40	Shaly clay	CH	A–7
Vashti: VaB, Vh	C	20–50	0–14	Loamy fine sand	SM	A–2
			14–40	Sandy clay loam	CL or SC	A–6
			40–42	Strongly cemented sandstone.		
Venus: VlA, VlB, VlC	B	>80	0–14	Loam	ML or CL or SM or SC	A–4
			14–50	Loam	ML or CL	A–4 or A–6
			50–60	Fine sandy loam	CL or ML	A–6 or A–4
Waurika: WaA, WaB, WaB2, WkA	D	>80	0–11	Fine sandy loam	SM or ML	A–4
			11–50	Clay	CH	A–7 or A–6
			50–64	Clay loam	SC or CL	A–6
Windthorst: WnC, WoB, WoB2, WoC, WoD, WsC2, WsD3.	C	>80	0–8	Fine sandy loam	SM	A–2 or A–4
			8–34	Sandy clay	CL	A–7
			34–42	Sandy clay loam	SC or CL	A–6
			42–60	Fine sand	SM	A–2

[1] Soft limestone, sandstone, or shale; rippable.

properties of the soils—Continued

Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction	Shrink-swell potential
			Inches per hour	*Inches per inch of soil*	*pH*	
95–100	90–100	75–85	0. 63–2. 0	0. 15–0. 18	7. 9–8. 4	High.
90–100	90–100	10–20	2. 0–6. 3	0. 05–0. 08	6. 1–6. 5	Low.
90–100	90–100	35–50	0. 20–0. 63	0. 14–0. 16	5. 6–6. 0	Low.
25–55	20–45	15–35	0. 63–2. 0	0. 05–0. 10	7. 9–8. 4	Low.
90–100	70–80	50–75	0. 06–0. 20	0. 15–0. 18	7. 4–7. 8	Moderate.
90–100	90–100	75–95	<0. 06	0. 16–0. 18	7. 8–8. 4	High.
90–100	90–100	75–95	<0. 06	0. 16–0. 20	7. 9–8. 4	High.
90–100	90–100	40–55	0. 63–2. 0	0. 12–0. 15	6. 1–6. 5	Low.
90–100	90–100	75–95	0. 06–0. 2	0. 15–0. 18	7. 4–7. 8	High.
90–100	90–100	75–99	0. 06–0. 2	0. 10–0. 15	7. 9–8. 4	High.
90–100	90–100	20–35	2. 0–6. 3	0. 07–0. 10	6. 1–6. 5	Low.
90–100	90–100	40–55	0. 63–2. 0	0. 14–0. 18	5. 6–6. 0	Moderate.
90–100	90–100	45–60	0. 63–2. 0	0. 13–0. 16	7. 9–8. 4	Moderate.
90–100	90–100	60–75	0. 63–2. 0	0. 13–0. 16	7. 9–8. 4	Moderate.
90–100	90–100	60–75	0. 63–2. 0	0. 10–0. 14	7. 9–8. 4	Low.
90–100	90–100	40–55	0. 2–0. 63	0. 12–0. 15	6. 1–7. 3	Low.
90–100	90–100	75–95	<0. 06	0. 16–0. 18	5. 6–8. 4	High.
90–100	90–100	40–55	0. 2–0. 63	0. 12–0. 15	7. 9–8. 4	Moderate.
100	90–100	30–45	2. 0–6. 3	0. 10–0. 13	6. 1–7. 3	Low.
100	80–100	60–80	0. 2–0. 63	0. 14–0. 17	5. 1–6. 0	Moderate.
100	90–100	40–55	0. 63–2. 0	0. 13–0. 16	5. 6–6. 0	Low.
100	90–100	20–35	2. 0–6. 3	0. 08–0. 10	5. 6–6. 0	Low.

TABLE 4.—*Engineering*

[No interpretations for Gullied land,

Soil series and map symbols	Suitability as source of— Topsoil	Suitability as source of— Road subgrade	Degree of limitations and soil features affecting— Highway location	Degree of limitations and soil features affecting— Foundations for low buildings	Degree of limitations and soil features affecting— Septic tank filter fields	Degree of limitations and soil features affecting— Sewage lagoons
Altoga: AaD3, AdE2, AlD2. For Duffau part of AdE2, see Duffau series. For Lewisville part of AlD2, see Lewisville series.	Poor: calcium carbonate exceeds 40 percent.	Fair: moderate shrink-swell potential; fair traffic supporting capacity.	Moderate on slopes of less than 15 percent: moderate shrink-swell potential; fair traffic supporting capacity. Severe on slopes of more than 15 percent.	Moderate on slopes of less than 15 percent: moderate shrink-swell potential. Severe on slopes of more than 15 percent.	Moderate on slopes of less than 10 percent: moderate permeability. Severe on slopes of more than 10 percent.	Moderate on slopes of less than 7 percent: moderate permeability. Severe on slopes of more than 7 percent.
Arenosa	Poor: sand texture.	Good	None to slight	None to slight	Severe: inadequate filtration.	Severe: very rapid permeability.
Blanket: BaA, BaB, BaC3.	Fair: clay loam texture; thickness of material is 6 to 20 inches.	Fair: moderate shrink-swell potential; fair traffic supporting capacity.	Moderate: moderate shrink-swell potential; fair traffic supporting capacity.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.	Slight on slopes of less than 2 percent. Moderate on slopes of 2 to 5 percent.
Bolar: BcC2, BdC. For Denton part of BdC, see Denton series.	Fair: clay loam texture; calcium carbonate exceeds 40 percent; thickness of material is 6 to 20 inches.	Fair: moderate shrink-swell potential; fair traffic supporting capacity; bedrock at depth of 20 to 48 inches.	Moderate: moderate shrink-swell potential; fair traffic supporting capacity; bedrock at depth of 20 to 48 inches.	Moderate: moderate shrink-swell potential.	Severe: bedrock at depth of 20 to 48 inches.	Severe: bedrock at depth of 20 to 48 inches.
Bonti: Be. For Exray part of Be, see Exray series.	Fair: thickness of material is 6 to 20 inches.	Fair: moderate shrink-swell potential; fair traffic supporting capacity; thickness of material is 20 to 40 inches.	Severe: bedrock at depth of 20 to 40 inches.	Moderate: moderate shrink-swell potential.	Severe: bedrock at depth of 20 to 40 inches.	Severe: bedrock at depth of 20 to 40 inches.
Bosque: Bo	Good	Fair: fair traffic supporting capacity.	Moderate: flood hazard; fair traffic supporting capacity.	Severe: flood hazard.	Moderate: flood hazard; moderate permeability.	Moderate: moderate permeability.
Brackett: BrF, Bt. For Dugout part of BrF, see Dugout series. For Purves part of Bt, see Purves series.	Poor: calcium carbonate exceeds 40 percent; more than 10 percent coarse fragments.	Fair: fair traffic supporting capacity. Good below depth of 20 inches.	Moderate on slopes less than 15 percent: fair traffic supporting capacity. Severe on slopes greater than 15 percent.	Moderate on slopes less than 15 percent. Severe on slopes greater than 15 percent.	Severe on slopes greater than 10 percent; moderately slow permeability.	Moderate on slopes less than 7 percent; permeable substrata. Severe on slopes of more than 7 percent.

interpretations

Mine dumps, and Sandy alluvial land]

Degree of limitations and soil features affecting—Continued				Adverse soil features affecting—		
Corrosivity		Farm ponds		Irrigation	Terraces and diversions	Waterways
Uncoated steel	Concrete	Reservoir area	Embankments			
High: texture.	Low	Moderate: moderate permeability.	Moderate: medium compressibility.	Slopes	No adverse features.	Slopes.
Low	Low	Severe: very rapid permeability.	Severe: poor stability; poor resistance to piping and erosion.	Very rapid intake rate.	Poor stability; erodible.	Poor stability; erodible.
High: texture.	Low	Moderate: moderately slow permeability.	Moderate: medium compressibility.	No adverse features.	No adverse features.	No adverse features.
Moderate: texture.	Low	Severe: bedrock at depth of 20 to 48 inches.	Moderate: medium compressibility; thickness of material is 20 to 48 inches.	Bedrock at depth of 20 to 48 inches.	Bedrock at depth of 20 to 48 inches.	Bedrock at depth of 20 to 48 inches.
High: texture.	Low where pH is more than 6.0. Moderate where pH is 6.0 or less.	Severe: bedrock at depth of 20 to 40 inches.	Severe: stones on surface.	Bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.
High: resistivity.	Low	Moderate: moderate permeability.	Moderate: medium compressibility.	Topography; flood hazard.	Flood hazard	Flood hazard.
High: resistivity.	Low	Severe: permeable substrata at depth of 10 to 20 inches.	Moderate: medium compressibility.	Soft limestone at depth of 10 to 20 inches; slopes; stoniness.	Soft limestone at depth of 10 to 20 inches; stoniness.	Soft limestone at depth of 10 to 20 inches; stoniness.

450-374—72——5

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—			
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons
Bunyan: Bu, By	Good	Fair: fair traffic supporting capacity.	Severe: flood hazard.	Severe: flood hazard.	Severe: flood hazard.	Moderate: moderate permeability.
Chaney: ChC, Cn, CoC2.	Poor: loamy sand texture.	Fair: moderate shrink-swell potential; fair traffic supporting capacity.	Moderate: moderate shrink-swell potential; fair traffic supporting capacity; wetness.	Moderate: moderate shrink-swell potential.	Severe: slow permeability.	Slight on slopes of less than 2 percent. Moderate on slopes of 2 to 7 percent; 3 to 10 percent stones.
Crawford: CrB	Poor: clay texture.	Poor: very high shrink-swell potential; poor traffic supporting capacity.	Severe: very high shrink-swell potential; poor traffic supporting capacity; bedrock at depth of 20 to 36 inches.	Severe: very high shrink-swell potential.	Severe: very slow permeability; bedrock at depth of 20 to 36 inches.	Severe: bedrock at depth of 20 to 36 inches.
Demona: DaC	Poor: loamy sand texture.	Fair: moderate shrink-swell potential; fair traffic supporting capacity.	Moderate: moderate shrink-swell potential; fair traffic supporting capacity; wetness.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.	Slight where slopes are less than 2 percent. Moderate where slopes are 2 to 5 percent.
Denton: DeB	Poor: silty clay texture.	Poor: high shrink-swell potential.	Severe: high shrink-swell potential; bedrock at depth of 30 to 40 inches.	Severe: high shrink-swell potential.	Severe: slow permeability; bedrock at depth of 30 to 40 inches.	Severe: bedrock at depth of 30 to 40 inches.
Duffau: DfA, DfB, DfC, DuC2, DuD, DuD3.	Fair: thickness of material is 6 to 20 inches.	Fair: fair traffic supporting capacity.	Moderate: fair traffic supporting capacity.	None to slight	None to slight	Moderate on slopes of less than 7 percent; moderate permeability. Severe on slopes of 7 to 8 percent.
DlC	Poor: loamy sand texture.	Fair: fair traffic supporting capacity.	Moderate: fair traffic supporting capacity.	None to slight	None to slight	Moderate: moderate permeability.
Dugout	Poor: calcium carbonate exceeds 40 percent; more than 10 percent coarse fragments.	Poor: thickness of material is 10 to 20 inches.	Severe: bedrock at depth of 10 to 20 inches; slopes greater than 15 percent.	Severe: bedrock at depth of 10 to 20 inches; slopes greater than 15 percent.	Severe: bedrock at depth of 10 to 20 inches; slopes greater than 10 percent.	Severe: bedrock at depth of 10 to 20 inches; slopes greater than 7 percent.

interpretations—Continued

Degree of limitations and soil features affecting—Continued				Adverse soil features affecting—		
Corrosivity		Farm ponds				
Uncoated steel	Concrete	Reservoir area	Embankments	Irrigation	Terraces and diversions	Waterways
Moderate: texture.	Low	Moderate: moderate permeability.	Moderate: medium compressibility.	Flood hazard	Flood hazard	Flood hazard.
High: texture; wetness.	Low where pH is more than 6.0. Moderate where pH is 5.1 to 6.0.	None to slight	Moderate where less than 3 percent stones; fair erosion resistance. Severe where 3 to 10 percent stones.	Rapid initial intake rate.	No adverse features.	No adverse features except for stony phase.
High: texture.	Low where pH is greater than 6.0. Moderate where pH is 5.6 to 6.0.	Severe: bedrock at depth of 20 to 36 inches.	Moderate: medium compressibility; thickness of material is 20 to 36 inches.	Very slow intake rate; bedrock at depth of 20 to 36 inches.	Subject to cracking; bedrock at depth of 20 to 36 inches.	Bedrock at depth of 20 to 36 inches.
High: texture.	Low where pH is more than 6.0. Moderate where pH is 5.6 to 6.0.	Moderate: moderately slow permeability.	Moderate: fair erosion resistance.	Topography is undulating.	Poor stability	No adverse features.
High: texture.	Low	Severe: bedrock at depth of 30 to 40 inches.	Moderate: medium compressibility.	Slow intake rate; bedrock at depth of 30 to 40 inches.	Bedrock at depth of 30 to 40 inches.	Bedrock at depth of 30 to 40 inches.
Moderate: texture.	Low	Moderate: moderate permeability.	Moderate: fair erosion resistance.	No adverse features.	No adverse features.	No adverse features.
Moderate: texture.	Low	Moderate: moderate permeability.	Moderate: fair erosion resistance.	Rapid initial intake rate.	Poor stability.	No adverse features.
High: resistivity.	Low	Severe: bedrock at depth of 10 to 20 inches.	Severe: thickness of material is 10 to 20 inches.	Bedrock at depth of 10 to 20 inches.	Bedrock at depth of 10 to 20 inches.	Bedrock at 10 to 20 inches.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—			
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons
Exray	Poor: more than 10 percent stones.	Poor: bedrock at depth of 8 to 20 inches.	Severe: bedrock at depth of 8 to 20 inches.	Severe: bedrock at depth of 8 to 20 inches.	Severe: bedrock at depth of 8 to 20 inches.	Severe: bedrock at depth of 8 to 20 inches.
Frio: Fr	Fair: clay loam texture.	Fair: fair traffic supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic supporting capacity; moderate shrink-swell potential; flood hazard.	Severe: flood hazard.	Severe: moderately slow permeability.	Slight
Gowen: Go	Fair: clay loam texture.	Fair: moderate shrink-swell potential; fair traffic supporting capacity.	Moderate: fair traffic supporting capacity; moderate shrink-swell potential; flood hazard.	Severe: flood hazard.	Moderate: flood hazard; moderate permeability.	Moderate: moderate permeability.
Hensley: HeB, Hn	Poor: clay texture.	Poor: thickness of material is 12 to 20 inches.	Severe: bedrock at depth of 12 to 20 inches.	Severe: bedrock at depth of 12 to 20 inches.	Severe: bedrock at depth of 12 to 20 inches.	Severe: bedrock at depth of 12 to 20 inches.
Houston Black: HoA, HoB.	Poor: clay texture.	Poor: very high shrink-swell potential; poor traffic supporting capacity.	Severe: very high shrink-swell potential; poor traffic supporting capacity.	Severe: very high shrink-swell potential.	Severe: very slow permeability.	Slight on slopes of less than 2 percent. Moderate on slopes of more than 2 percent.
Lamar: LaB, LaC	Fair: calcium carbonate is 15 to 30 percent.	Fair: fair traffic supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: moderate permeability; 2 to 5 percent slopes.
Lewisville: LeB, LeC, LgC2. For Altoga part of LgC2, see Altoga series.	Fair: clay loam texture.	Fair: moderate shrink-swell potential; fair traffic supporting capacity.	Moderate: moderate shrink-swell potential; fair traffic supporting capacity.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: moderate permeability; 2 to 5 percent slopes.
Lindy: LnB, LnB2, LyB.	Fair: thickness of material is 20 to 40 inches.	Poor: high shrink-swell potential; poor traffic supporting capacity.	Severe: high shrink-swell potential; poor traffic supporting capacity.	Severe: high shrink-swell potential.	Severe: bedrock at depth of 20 to 40 inches.	Severe: bedrock at depth of 20 to 40 inches.

interpretations—Continued

Degree of limitations and soil features affecting—Continued				Adverse soil features affecting—		
Corrosivity		Farm ponds		Irrigation	Terraces and diversions	Waterways
Uncoated steel	Concrete	Reservoir area	Embankments			
High: texture.	Low where pH is more than 6.0. Moderate where pH is 5.6 to 6.0.	Severe: bedrock at depth of 8 to 20 inches.	Severe: thickness of material is 8 to 20 inches.	Bedrock at depth of 8 to 20 inches.	Bedrock at depth of 8 to 20 inches.	Bedrock at depth of 8 to 20 inches.
High: texture.	Low	Moderate: moderately slow permeability.	Moderate: medium compressibility.	Moderately slow intake rate; flood hazard.	Flood hazard	Flood hazard.
Moderate: texture.	Low	Moderate: moderate permeability.	Moderate: medium compressibility.	Flood hazard	Flood hazard	Flood hazard.
High: texture.	Low	Severe: bedrock at depth of 12 to 20 inches.	Severe: thickness of material is 12 to 20 inches.	Bedrock at depth of 12 to 20 inches.	Bedrock at depth of 12 to 20 inches.	Bedrock at depth of 12 to 20 inches.
Very high: resistivity.	Low	None to slight	Moderate: fair stability; high compressibility.	Very slow intake rate.	No adverse features.	Poor stability; erodible.
Moderate: resistivity.	Low	Moderate: moderate permeability.	Moderate: medium compressibility.	No adverse features.	No adverse features.	No adverse features.
High: resistivity.	Low	Moderate: moderate permeability.	Moderate: medium compressibility.	No adverse features.	No adverse features.	No adverse features.
High: texture.	Low	Severe: bedrock at depth of 20 to 40 inches.	Moderate: fair stability; medium compressibility.	Slow intake rate; bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—			
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons
Maloterre: Ma	Poor: more than 10 percent coarse fragments.	Poor: thickness of material is 3 to 12 inches; high shrink-swell potential.	Severe: bedrock at depth of 3 to 12 inches.	Severe: bedrock at depth of 3 to 12 inches.	Severe: bedrock at depth of 3 to 12 inches.	Severe: bedrock at depth of 3 to 12 inches.
May: MfA, MfB	Good	Fair: fair traffic supporting capacity.	Moderate: fair traffic supporting capacity.	None to slight	Moderate: moderate permeability.	Moderate: moderate permeability.
Nimrod: NdC, NpB, NpD. For Arenosa part of NpB and NpD, see Arenosa series. For Patilo part of NpB and NpD, see Patilo series.	Poor: fine sand texture.	Fair: thickness of material is 20 to 40 inches.	Moderate: fair traffic supporting capacity; wetness.	Moderate: wetness.	Severe: moderately slow permeability.	Moderate: slopes of 2 to 7 percent; texture is fine sand in upper 20 to 40 inches.
Owens: OwE	Poor: clay texture.	Poor: very high shrink-swell potential; poor traffic supporting capacity.	Severe: very high shrink-swell potential; poor traffic supporting capacity; slopes of 15 to 20 percent.	Severe: very high shrink-swell potential; slopes of 15 to 20 percent.	Severe: very slow permeability; slopes of 10 to 20 percent.	Moderate where slopes are 3 to 7 percent. Severe where slopes are 7 to 20 percent.
Patilo	Poor: fine sand texture.	Good where there is more than 5 feet of material. Fair where there is 3 to 5 feet of material.	None to slight	None to slight	Severe: moderately slow permeability.	Severe: texture is fine sand 40 to 72 inches thick.
Purves: PcB, PcC, Pd. For Dugout part of Pd, see Dugout series.	Poor: clay texture.	Poor: high shrink-swell potential; bedrock at depth of 6 to 20 inches.	Severe: high shrink-swell potential; bedrock at depth of 6 to 20 inches.	Severe: high shrink-swell potential; bedrock at depth of 6 to 20 inches.	Severe: bedrock at depth of 6 to 20 inches.	Severe: bedrock at depth of 6 to 20 inches.
Selden: SdC, SeC2	Poor: fine sand texture.	Fair: fair traffic supporting capacity; wetness.	Moderate: fair traffic supporting capacity; wetness.	Moderate: wetness.	Severe: moderately slow permeability.	Slight where slopes are 0 to 2 percent. Moderate where slopes are 2 to 5 percent.
Somervell: Sm. For Maloterre part of Sm, see Maloterre series.	Poor: more than 35 percent coarse fragments.	Fair: thickness of material is 20 to 40 inches; fair traffic supporting capacity.	Severe: bedrock at depth of 20 to 40 inches; slopes.	Severe: bedrock at depth of 20 to 40 inches; slopes.	Severe: bedrock at depth of 20 to 40 inches.	Severe: bedrock at depth of 20 to 40 inches; slopes.

interpretations—Continued

Degree of limitations and soil features affecting—Continued				Adverse soil features affecting—		
Corrosivity		Farm ponds		Irrigation	Terraces and diversions	Waterways
Uncoated steel	Concrete	Reservoir area	Embankments			
High: texture.	Low	Severe: bedrock at depth of 3 to 12 inches.	Severe: thickness of material is 3 to 12 inches.	Bedrock at depth of 3 to to 12 inches.	Bedrock at depth of 3 to to 12 inches.	Bedrock at depth of 3 to 12 inches.
Moderate: texture.	Low	Moderate: moderate permeability.	Moderate: medium compressibility.	No adverse features.	No adverse features.	No adverse features.
Moderate: wetness.	Moderate where pH is 5.5 to 6.0. Low where pH is more than 6.5.	Moderate: moderately slow permeability.	Moderate: poor resistance to piping and erosion.	Rapid intake rate.	Poor stability; erodible.	Poor stability; erodible.
High: texture.	Low	None to slight	Severe: more than 3 percent stones on surface.	Very slow intake rate; slopes; shale at depth of 12 to 20 inches; stones.	Shale at depth of 12 to 20 inches; stones.	Shale at depth of 12 to 20 inches; slopes; stones.
Low	Moderate where pH is 5.1 to 6.0.	Moderate: moderately slow permeability.	Moderate: poor resistance to piping and erosion.	Rapid initial intake rate.	Poor stability; erodible.	Poor stability; erodible.
High: texture.	Low	Severe: bedrock at depth of 6 to 20 inches.	Severe: thickness of material is 6 to 20 inches.	Bedrock at depth of 6 to 20 inches.	Bedrock at depth of 6 to 20 inches.	Bedrock at depth of 6 to 20 inches.
Moderate: texture; wetness.	Moderate where pH is 5.6 to 6.0.	Moderate: moderately slow permeability.	Slight	Rapid initial intake rate.	Poor stability; erodible.	Poor stability; erodible.
Moderate: texture.	Low	Severe: bedrock at depth of 20 to 40 inches.	Moderate: thickness of material is 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.	Bedrock at depth of 20 to 40 inches.

TABLE 4.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitations and soil features affecting—			
	Topsoil	Road subgrade	Highway location	Foundations for low buildings	Septic tank filter fields	Sewage lagoons
Thurber: Tk. For Waurika part of Tk, see Waurika series.	Fair: clay loam texture; thickness of material is 6 to 20 inches.	Poor: high shrink-swell potential; poor traffic supporting capacity.	Severe: high shrink-swell potential; poor traffic supporting capacity.	Severe: high shrink-swell potential.	Severe: very slow permeability.	Slight.
Trinity: Tn	Poor: clay texture.	Poor: high shrink-swell potential; poor traffic supporting capacity.	Severe: high shrink-swell potential; poor traffic supporting capacity; flood hazard.	Severe: wetness; flood hazard; high shrink-swell potential.	Severe: flood hazard; very slow permeability.	Moderate: organic matter content.
Truce: TrC, TuF	Fair: thickness of material is 6 to 20 inches; stones on surface.	Poor: high shrink-swell potential; poor traffic supporting capacity.	Severe: high shrink-swell potential; poor traffic supporting capacity; slopes.	Severe: high shrink-swell potential; slopes.	Severe: slow permeability; slopes.	Slight on 1 to 2 percent slopes. Moderate on 2 to 7 percent slopes. Severe on 7 to 40 percent slopes; stones.
Vashti: VaB, Vh	Fair: thickness of material is 6 to 20 inches.	Fair: moderate shrink-swell potential; fair traffic supporting capacity; thickness of material is 20 to 50 inches.	Moderate: moderate shrink-swell potential; fair traffic supporting capacity; wetness.	Moderate: moderate shrink-swell potential; wetness.	Severe: bedrock at depth of 20 to 50 inches.	Severe: bedrock at depth of 20 to 50 inches.
Venus: VIA, VIB, VIC.	Good	Fair: fair traffic supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	None to slight	Moderate: moderate permeability; 2 to 5 percent slopes.
Waurika: WaA, WaB, WaB2, WkA.	Fair: thickness of material is 6 to 20 inches.	Poor: high shrink-swell potential; poor traffic supporting capacity.	Severe: high shrink-swell potential; poor traffic supporting capacity.	Severe: high shrink-swell potential.	Severe: very slow permeability.	None to slight on 0 to 2 percent slopes. Moderate on 2 to 3 percent slopes.
Windthorst: WnC, WoB, WoB2, WoC, WoD, WsC2, WsD3.	Fair: thickness of material is 6 to 20 inches.	Fair: fair traffic supporting capacity; moderate shrink-swell potential.	Moderate: fair traffic supporting capacity; moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Severe: moderately slow permeability.	Slight on 1 to 2 percent slopes. Moderate on 2 to 7 percent slopes. Severe on 7 to 8 percent slopes.

interpretations—Continued

Degree of limitations and soil features affecting—Continued				Adverse soil features affecting—		
Corrosivity		Farm ponds		Irrigation	Terraces and diversions	Waterways
Uncoated steel	Concrete	Reservior area	Embankments			
High: texture.	Low	None to slight	Moderate: fair stability; medium compressibility.	Very slow intake rate.	No adverse features.	No adverse features.
Very high: texture; wetness.	Low	None to slight	Moderate: fair stability; medium compressibility.	Flood hazard	Flood hazard	Flood hazard.
High: texture.	Low	None to slight	Moderate: fair stability; medium compressibility.	Slow intake rate; slope.	No adverse features.	No adverse features, except for stony phase.
Moderate: wetness.	Moderate where pH is 5.6 to 6.0.	Severe: bedrock at depth of 20 to 50 inches.	Moderate: thickness of material is 20 to 50 inches.	Bedrock at depth of 20 to 50 inches.	Bedrock at depth of 20 to 50 inches.	Bedrock at depth of 20 to 50 inches.
High: resistivity.	Low	Moderate: moderate permeability.	Moderate: fair stability.	No adverse features.	No adverse features.	No adverse features.
High: texture.	Low where pH is more than 6.0. Moderate where pH is 5.6 to 6.0.	None to slight	Moderate: fair stability.	Very slow intake rate.	No adverse features.	No adverse features.
High: texture.	Moderate where pH is 5.1 to 6.0.	Moderate: moderately slow permeability.	Moderate: medium compressibility.	No adverse features.	No adverse features.	No adverse features.

TABLE 5.—*Engineering test data for soil*

[Tests performed by the Texas Highway Department in accordance with standard

Soil name and location	Parent material	Texas report No.	Depth from surface	Shrinkage		
				Limit	Ratio	Lineal
			Inches	*Pct.*		*Pct.*
Denton silty clay: 6.5 miles SE. of Stephenville (modal).	Fractured bed of shell limestone.	62–360–R	6–18	15	1. 82	10. 4
		62–361–R	18–36	10	2. 00	17. 4
Duffau fine sandy loam: 6.4 miles W. of Dublin and 1 mile S. of Farm Road 219 and 20 feet W. of county road (modal).	------------------------	62–348–R	14–26	14	1. 84	9. 3
		62–349–R	35–60	16	1. 77	3. 7
Houston Black clay: 8.6 miles E. of Stephenville and 30 feet S. of U.S. Highway 67 (modal).	Shell limestone.	62–364–R	0–30	10	1. 97	22. 2
5 miles E. of Stephenville and 0.65 mile S. of U.S. Highway 67 and 50 feet S. of county road (less clay than in modal).	Shell limestone.	62–358–R	6–20	10	1. 97	18. 8
		62–359–R	54–70	14	1. 92	10. 2
May fine sandy loam: 8 miles S. of Stephenville (modal).	Alluvium.	62–354–R	7–23	15	1. 85	9. 8
		62–355–R	30–50	12	1. 95	9. 8
6.4 miles E. of Dublin (finer texture than in modal).	Alluvium.	62–356–R	7–15	14	1. 89	11. 9
		62–357–R	40–60	12	1. 93	11. 9
Nimrod fine sand: 3 miles E. of Stephenville and 0.6 mile S. of U.S. Highway 67 and 50 feet E. of county road (sandier texture than in modal).	------------------------	62–342–R	0–6	16	1. 76	2. 8
		63–343–R	20–39	16	1. 80	6. 3
Windthorst fine sandy loam: 7.1 miles E. of Dublin and 0.3 mile S. of Farm Road 847 (finer textured B horizon than in modal).	------------------------	62–352–R	9–17	12	1. 94	17. 9
		62–353–R	37–47	11	1. 94	14. 5

[1] Mechanical analysis according to AASHO Designation: T88–57. Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2

samples taken from 8 selected soil profiles

procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [1]								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than—						
⅜ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.002 mm.			AASHO	Unified [2]
								Pct.			
100	97	87	65	53	49	25	17	37	18	A-6(7)	CL
100	98	91	74	67	62	42	33	48	29	A-7-6(15)	CL
---------	----------	100	99	52	50	32	30	33	19	A-6(7)	CL
---------	----------	100	98	50	38	16	15	23	5	A-4(3)	SM-SC
---------	100	99	99	94	90	55	44	67	42	A-7-5(20)	CH
---------	----------	100	95	85	80	48	43	54	31	A-7-6(19)	CH
100	99	96	85	75	72	41	26	34	18	A-6(11)	CL
---------	----------	----------	----------	57	44	28	25	34	20	A-6(8)	CL
---------	100	97	87	60	55	38	28	31	18	A-6(8)	CL
---------	----------	----------	100	60	49	31	29	39	24	A-6(11)	CL
100	99	99	99	60	52	35	31	36	25	A-6(11)	CL
---------	----------	----------	100	14	9	3	2	21	3	A-2-4(0)	SM
---------	----------	100	99	43	35	23	22	28	15	A-6(3)	SC
---------	----------	100	98	66	62	50	47	53	32	A-7-6(16)	CH
---------	----------	100	99	61	51	35	32	42	27	A-7-6(12)	

millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[2] SCS and BPR have agreed to consider that all soils having plasticity indexes within 2 points of the A-line are to be given a borderline classification. An example of borderline classification obtained by this use is SM-SC.

Estimated properties of the soils

When an engineer knows the physical properties of the soil materials and their in-place condition, he is able to make the best use of the soil maps and the soil survey report.

Table 3 gives the estimated engineering classification and some of the estimated physical properties of the soils in Erath County. Some of the estimates were made on the basis of tests of 8 samples from 6 soil series. For most soils, properties were estimated by comparing these soils with the soils of similar series.

The hydrologic group placement of a soil is made on the basis of water intake after a heavy rain and the soil has had an opportunity to swell. Soils are tested bare, without the protective effects of vegetation. The four groups range from open sands, Group A—lowest runoff potential, to heavy clays, Group D—highest runoff potential. For a description of these four groups, see *Hydrologic soil groups* in the Glossary at the back of the report.

Depth to bedrock is the distance from the surface to solid rock or other impervious material that underlies the soil.

The depth to the water table is not shown in table 3 because the water table is many feet below the surface in all soils in this county except Sandy alluvial land, which has a water table 1 to 3 feet below the surface.

In the column headed "Percentage passing sieve," estimates are given for a range in percentage of soil materials passing three different sieve sizes. This information is useful in helping to determine suitability of the soil as a source of material for construction purposes.

Permeability, as shown in table 3, is the estimated rate in inches per hour that water moves downward through undisturbed and uncompacted soil. It does not include lateral seepage. The estimates are based on structure and porosity of the soil. Plowpans, surface crusts, and other properties resulting from use of the soils are not considered.

The available water capacity is the amount of water that a soil can hold and make available to plants when the soil is wet to field capacity. It is the numerical difference between the percentage of water at field capacity and the percentage of water at the time plants wilt. The rate is expressed as inches of water per inch of soil depth. For example, a layer of Frio clay loam 1 inch thick will hold 0.18 inch of available water when wet to field capacity.

Reaction is the degree of acidity or alkalinity of a soil expressed as a pH value. The pH of a neutral soil is 7.0, of an acid soil is less than 7.0, and of an alkaline soil is more than 7.0. The soils in Erath County are nearly evenly divided between acid and alkaline. For a description of the pH groups used in table 3, see *Reaction, soil* in the Glossary at the back of this publication.

The shrink-swell potential indicates a change in volume that occurs in a soil with changes in moisture content. A knowledge of this potential is important in planning the use of a soil for building roads and other engineering structures. Shrink-swell potential is rated *low*, *moderate*, *high*, and *very high*. In general, deep clayey soils, such as Houston Black clay, Trinity clay, and Crawford clay, have a high or very high shrink-swell potential. The shrink-swell potential is low in clean sands and gravel, in soils having small amounts of nonplastic to slightly plastic fines, and in most other nonplastic to slightly plastic soil material. Brackett gravelly clay loam is an example of a soil with low shrink-swell potential.

Engineering interpretations

In table 4 the soils are rated according to their suitability as a source of topsoil and road subgrade. Also listed for the soils are properties that affect their suitability as a site for a specified engineering use. The estimates in table 4 were made on the basis of the test data obtained from soil samples tested in the laboratory, the properties listed in table 3, and observations of the field performance of the soils.

Topsoil is fertile soil material that ordinarily is rich in organic matter. It is used to topdress areas where vegetation is to be established and maintained, such as roadbanks, dams, disturbed areas, gardens, and lawns. Normally, only the surface layer is removed for topsoil, but other layers also may be suitable sources. Loamy fertile Bosque soils are a good source of topsoil. On the other hand, Brackett soils are a poor source of topsoil because they are gravelly.

Road fill or subgrade refers to soil material useful for building up road grades for supporting base layers. The suitability of a soil for road fill depends largely on its texture, plasticity, shrink-swell potential, traffic supporting capacity, inherent erodibility, compaction characteristics, and natural water content. Clayey soils that have a very high shrink-swell potential, such as Crawford clay, Houston Black clay, and Denton silty clay, are difficult to place and compact. They are rated poor as a source of road fill or subgrade.

Most of the soils in the county are not suitable as a source of sand or gravel, although shallow limestone rock in soils such as Brackett and Maloterre can be crushed and used for gravel. This gravel makes good road subgrade material.

Highway location is influenced by features of the undisturbed soil that affect construction and maintenance of highways. In flat terrain, the features apply to the soil materials in the A and B horizons; in steeper terrain, slopes of 5 percent or steeper, they apply primarily to the soil materials in the C horizon. Soils such as Houston Black clay, Lewisville clay loam, and Waurika soils have impeded internal drainage and low stability when wet. These soils make poor sites for highways. Loamy fine sands, which are very erodible and have a low percentage of fine material passing the No. 200 sieve, are poorly graded and generally lack stability unless they are properly confined. These soils are fair to good for highway construction. Coarser textured and better graded soils make better sites for highways and are rated good for this purpose.

Foundations for low buildings are affected by features of the undisturbed soil that influence its capacity to support low buildings that have normal foundation loads. Specific values of bearing strength are not assigned.

Filter fields for septic tanks are affected by permeability, location of water table, and susceptibility to flood-

ing. The degree of limitations and principal reasons for assigning moderate or severe limitations are given.

Sewage lagoons are influenced by permeability, location of water table, and slope. The degree of limitation and principal reasons for assigning moderate or severe limitations are given.

An experienced sanitation engineer should be consulted before a septic tank or sewage lagoon is installed anywhere in the county, because most of the soils are subject to percolation of water down through the soil. All septic tanks should be located downslope from domestic water supplies and residences.

Corrosivity, as used in table 4, indicates the potential danger to uncoated steel and concrete pipelines through chemical action that dissolves or weakens the structural material. This deterioration occurs more rapidly in some kinds of soil that in others. Extensive installations, which intersect soil boundaries or soil horizons, are more likely to be damaged by corrosion than are installations entirely in one kind of soil or soil horizon. Steel pipe should have a protective coating to retard corrosion when placed in any soil in the county.

Farm pond reservoir area suitability depends primarily on the seepage rate of the soil. Highly plastic soils have low seepage. Coarse-textured soils have no binding or sealing characteristics; therefore, they have a high seepage rate. Many of the soils in the county are unsuitable for reservoir areas because of high permeability, stoniness, or shallow depth to hard limestone or sandstone. These are shown in table 4.

Embankments for farm ponds are influenced by soil stability, compaction characteristics, susceptibility to piping, shrink-swell potential, compacted permeability, compressibility, erosiveness, and gypsum content. Both the subsoil and substratum are evaluated where they are contrasting in character and have significant thickness for use as borrow.

Suitability of the soils for irrigation depends largely on intake rate, available water capacity, depth of soil, slope of land, and flooding hazard. Most of the soils can be irrigated by the sprinkler application method, but some of the less permeable soils that have a high shrink-swell potential can be properly irrigated only by flooding. These soils crack when they dry, and a large amount of water applied initially is most desirable to fill the cracks before the soil swells and seals the cracks. The Houston Black, Purves, Trinity, Truce, and Crawford soils are best suited to controlled flooding irrigation.

Soil features that affect the suitability of a soil for terraces and diversions are slope, depth to bedrock or other compacted material, texture, and stability. The Arenosa, Patilo, Nimrod, Demona, Selden, and Chaney soils generally do not have sufficient binding material and are not considered suitable for terraces. These soils are fine sands and loamy sands. The Vashti and Windthorst soils have a thin surface layer of sand over a good binding material that is suitable for terraces. Houston Black clay and Crawford clay are subject to cracking, but these clays can be terraced.

Grassed waterways are developed on soils to carry off excess water that is discharged from terraces, diversions, and other areas. Shallow depth to limestone adversely affects the construction of waterways, makes the soil droughty, and retards the establishment of vegetation. The Brackett and Dugout soils are examples of soils that are shallow and underlain by limestone. Frequent flooding also is hazardous to waterways. Floodwaters may retard or kill the plants in the waterways. The Bosque loam and Bunyan soils are examples of soils that have flooding hazards.

Engineering test data

Table 5 gives the engineering test data for soil samples from eight soil profiles of six different soil series in Erath County. The tests were performed by the Texas State Highway Department Testing Laboratory in accordance with standard procedures of the American Association of State Highway Officials. The test data for the soil samples indicate the engineering characteristics of the soil at the specific location given. At other locations in the county those same soils will probably have very similar characteristics.

Parent material refers to the unconsolidated mass from which a soil develops. It includes the C horizon and may include materials above the C horizon. For a more detailed description of Erath County parent materials, see the section "Formation and Classification of Soils" in this survey.

The shrinkage limit is that point of moisture content reached during the process of drying at which shrinkage of the soil stops. As moisture leaves, the soil decreases in volume in direct proportion to the loss in moisture, unless a condition of equilibrium is reached where shrinkage stops although additional moisture is removed. The shrinkage limit is the moisture content when shrinkage stops and is reported as a percentage of the oven-dried weight of the soil.

Shrinkage ratio is determined by taking the volume change of a soil that dries from a wet stage to the shrinkage limit and dividing this by the weight change of the soil during the same drying period. For this calculation, volume and weight changes are expressed as percentages of the volume and weight of the oven-dried soil sample.

Lineal shrinkage is the decrease in one dimension, expressed as a percentage of the original dimension, of the soil mass when the moisture content is reduced from the stipulated percentage to the shrinkage limit.

Mechanical analysis shows the percentage, by weight, of soil particles passing through sieves of specified sizes. Gravel ranges from 3 inches in diameter to just over 2 millimeters, the size of the No. 10 sieve. Sand ranges from 2 mm. to just over 0.074 mm., the size of the No. 200 sieve. AASHO standards define silt as soil particles between 0.074 mm. and 0.005 mm. in size, and clay, as soil particles smaller than 0.005 mm. USDA definitions of silt and clay, given in the Glossary, have slightly different boundaries. Clay fraction in these tests was determined by the hydrometer method, rather than the pipette method.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a solid to a plastic state. If the moisture content is further increased, the material changes from plastic to a liquid state. The plastic limit is the moisture content at which the soil material

passes from solid to plastic. The liquid limit is the moisture content at which the material changes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

The AASHO and Unified classifications have been explained earlier in the engineering section.

Use of Soils in Urban Development

Soil characteristics and properties become increasingly important as soil use intensifies. When land utilization changes from range or cropland to urban development, soil features and limitations generally determine how the land is used. The greater the limitation for a use, the more costly it is to develop and maintain an area for that use. Information of the kind given in tables 3, 4, and 5 is especially helpful to community planners, developers, and industrial users of land. Other information useful to planners is contained in the soil maps and in other parts of the survey. Through utilization of the information in this survey, alternative uses can be developed as a basis for long-range planning.

For dwellings, the degree of limitation depends on permeability, percolation, stability, flood hazard, wetness, depth to water table, depth to bedrock, topography, and suitability for lawn grasses, shrubs, and trees. It is unfortunate when water floods a few acres of range or a field, but it can be catastrophic to an owner if a home, shopping center, or factory is flooded. On the other hand, recreation facilities are often enhanced if placed next to a waterway, even though grounds may occasionally flood. In Erath County, flooding is likely on the Frio, Trinity, Gowen, Sandy alluvial land, Venus, Bosque, and Bunyan soils.

Soil features that affect use of the soils for commercial buildings and light industry include drainage, bearing capacity, shear strength, slope, compressibility, and shrink-swell potential. Characteristics and properties of the substratum are most important because foundations for these structures rest on this part of the soil. Some of the soils in the county that have a high shrink-swell potential are in the Crawford, Lindy, Owens, Houston Black, Trinity, and Truce series.

Installation and maintenance of utility lines is affected by depth to bedrock, natural drainage, water table characteristics, and corrosion potential. Steel pipe should have a protective coating to retard corrosion when placed in any soil in Erath County. Depth to bedrock for all soils is given in table 3.

Ground water for domestic use can be found at almost any location except some areas in the north central part of the county. The location of larger quantities of water is discussed in the subsection on irrigation water.

Ratings for use of soils for cemeteries, mass transit systems, parks, recreational areas, sanitary land fills, and other urban land uses can be developed from the information in this survey. Soil scientists with the Bosque, Palo Pinto, and Upper Leon Soil and Water Conservation Districts will gladly furnish assistance in determining ratings for these and other land uses.

Formation and Classification of Soils

This section consists of three main parts. The first part briefly discusses the five major factors of soil formation in terms of their effect on the soils of Erath County. The second part discusses the processes of soil horizon differentiation. In the third part, the comprehensive system of soil classification is discussed, and the soil series are classified in table form.

Factors of Soil Formation

Soil is the product of the interaction of the five major factors of soil formation. These factors are climate, living organisms (especially vegetation), parent material, topography, and time. The kind of soil that develops at any point on the earth is determined by these interacting factors.

Climate and living organisms are the active forces in soil formation. These forces act on the parent material, which has accumulated through the weathering of rock and unconsolidated deposits, and slowly changes the material into a natural body that has genetically related horizons. The effects of climate and living organisms are conditioned by relief, or topography. The parent material itself affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil pedon. The amount of time may be long or short, but generally, a long time is required for distinct horizons to develop in a soil.

The interrelationship among the five factors of soil formation is complex, and the effect of any one factor is difficult to isolate. Each factor is discussed separately in the paragraphs that follow, but it is the interaction of all these factors, rather than their simple sum, that determines the nature of the soil.

Climate

Erath County has a warm-temperate, subhumid climate and hot summers. This climate contributes to the formation of soils in several ways. Expansion that occurs at high temperatures and contraction that occurs at low temperatures fracture parent rock and soil material and hasten weathering. Patterns of rainfall distribution cause the soils to be alternately wet and dry. When clay soils such as Houston Black and Crawford clays dry, they crack severely, and the cracks fill with water when it rains. After they become wet, the clay soils swell enough to close the cracks. This alternate shrinking and swelling causes the soil to churn and prevents the formation of clay accumulations. Other soils, such as Windthorst and Nimrod, have clayey lower layers. Water moving through the soil carries clay particles downward from the surface layer and deposits them as the water movement slows. As clay accumulates, the water moves even slower and deposition of clay accelerates. Thus, the process tends to speed up, and eventually, the lower layers become clayey. Wind also affects the formation of soils in the county. Soil material that developed into Patilo and Nimrod soils has been reworked by wind.

Living organisms

Plants, man, animals, insects, bacteria, worms, and fungi are important in the formation of soils. Gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity are among the changes caused by living organisms. In the Grand Prairie, tall prairie grasses had more influence on soil development than other plants. These tall grasses provided litter that protected the surface and added organic matter to dark soils, such as Houston Black, Denton, and Purves. The grass roots reached deep into the soil and fed on minerals at lower depths. Lime, minerals, and organic matter were distributed throughout the soil profile as these plants died and decomposed. The decomposed plant roots left channels that increased intake of water and the aeration of the soil. Earthworms and other soil organisms fed on the decomposed roots. The borings of earthworms also helped channel water and air through the soil.

The vegetation, dominantly oak-savanna, has affected soils formed in the Cross Timbers and Grand Prairie land resource areas. The soils formed under hardwood vegetation are medium to low in organic matter and have light colored surface layers. Some of these soils are Windthorst, Nimrod, Bonti, and Vashti.

Man has also influenced soil formation. He permitted cattle to graze the vegetation on the land. He plowed the land and planted crops. These activities have their influence on soil formation.

Parent material

Parent material is the unconsolidated mass from which a soil is formed. It determines the limits of the chemical and mineralogical composition of the soil. The soils of Erath County have developed from parent materials of three geologic ages, the Pennsylvanian, the Cretaceous, and the Pleistocene or Recent age.

Pennsylvanian age materials in the county are mainly interbedded sandstones and shales of the Strawn Group (*4*). These materials are in the northwestern part of the county. The sandstones are mostly acid, while the shales are alkaline. Acid soils, such as Bonti and Exray, occupy ridges where the sandstone is near the surface. Truce soils developed where shale is more than 20 inches below the surface. The Truce soils are neutral to acid in the upper part and alkaline in the lower part. Owens, a shallow, calcareous, clayey soil, occupies more sloping hillsides where the shale is near the surface.

Cretaceous age materials are mainly interbedded limestones, calcareous marls, and sands of the Fredericksburg and Trinity Groups (*4*). These materials are in the southern two-thirds of the county. The limestones and marls are interbedded and are mainly from the Walnut and Glen Rose Formations (*4*). Maloterre, Purves, Dugout, and Brackett soils occupy the gently sloping to steep benched hills and ridges where the limestone is near the surface. Denton and Houston Black soils lie in shallow valley areas where the interbeds of calcareous clayey marl occur. These soils are more limy and have less distinct horizons than the Windthorst and Nimrod soils. Some of the sandier soils in the county were formed from two separate sand formations, the Paluxy Sand and the Trinity Sand (*4*). In Erath County, the Paluxy Sand is separated from the Trinity Sand by the Glen Rose Limestone Formation (*3*). Nimrod, Selden, Windthorst, and Duffau soils were mainly developed in the Paluxy Sand Formation. Demona, Chaney, and Windthorst soils were developed in the Trinity Sand Formation. These soils are more acid and have more distinct soil horizons than the soils developed from limestone and marl.

The parent material of the soils on the flood plains of the rivers and drainageways of the county consists of recent deposits of alluvium. Many of these deposits on lower lying flood plains have been reworked from time to time, and new sediments have been deposited. Alkaline soils formed in deposits from the calcareous prairie areas are the Frio, Bosque, and Trinity. Soils formed from a mixture of clayey and sandy sediments are the Gowen and Bunyan.

Topography

Topography, or relief, affects soil formation through its influence on drainage, erosion, plant cover, and soil temperature.

The topography in Erath County ranges from nearly level along streams and valleys to steep along escarpments. The Owens soils developed mainly on south-facing slopes, and the Truce soils developed on the north-facing slopes in similar materials. Soil temperature is higher, plant cover is thinner, and erosion is greater on the south-facing slopes. Truce soils are moderately deep and have well defined soil horizons; the Owens soils are shallow and have less distinct horizons than the Truce soils.

The Altoga and Lewisville soils also developed from similar parent materials. Generally, the Altoga soils occupy steeper more eroded areas than the Lewisville soils. Erosion has kept the surface layer of Altoga soils thin and light colored. Lewisville soils, in contrast, have dark surface layers. In some of the steeper limestone areas, thin soils, such as the Maloterre and Purves, have developed because geologic erosion has removed the soil material faster than soil horizons developed.

Time

Time, usually a long time, is required for formation of soils that have distinct horizons. The differences in length of time that parent materials have been in place, therefore, are commonly reflected in the degree of development of the soil.

The soils in Erath County range from young to old. The young soils have very little horizon development, and the older soils have well expressed soil horizons.

Bunyan soils are an example of young soils that have little development. The soil horizons of Bunyan soils still show the evidence of stratification, and there has been very little change from the original stream deposited alluvium. Nimrod soils are an example of older soils that have well developed soil horizons. The parent materials of Nimrod soils have been in place for a long time. There has been a downward movement and accumulation of clay particles, and accumulation of a thin darkened upper surface layer, and the development of a thick leached lower surface layer.

Processes of Soil Horizon Differentiation

This subsection contains a brief definition of the horizon nomenclature and processes responsible for horizon development. A further discussion of soil horizons and the detailed descriptions of representative profiles of each soil series are in the section "Descriptions of the Soils."

Marks left by the soil-forming factors are recorded in the soil profile. A succession of layers, or horizons, is formed from the surface down to rock. The horizons differ in one or more properties such as thickness, color, texture, structure, consistence, porosity, or reaction.

Most soil profiles contain three major horizons that are designated A, B, and C. In some young soils, a B horizon has not developed. In other soils a R, or rock, horizon is present. Several processes are involved in the formation of these horizons. In Erath County, the main processes are accumulation of organic matter; leaching of calcium carbonates and bases; and formation and translocation of silicate clay minerals. In most soils, more than one of these processes have been active in the development of horizons.

The A horizon is the surface layer. It can be either the horizon of maximum organic matter, called the A1, or the horizon of maximum leaching of dissolved or suspended materials, called the A2 (*7*). The soils of Erath County range from low to high in organic matter content. Nimrod soils have a thin A1 horizon and a thick A2 horizon that is low in organic matter. Frio soils have a thick dark A1 horizon that is high in organic matter.

The B horizon lies immediately beneath the A horizon. It is the horizon of maximum accumulation of dissolved or suspended materials, such as iron or clay; or it may be an altered horizon that shows distinct structure but little evidence of clay translocation and accumulation. B horizons that contain significant accumulations of clay are given a Bt horizon designation. The Bt horizon is usually firmer than horizons immediately above or below and usually has a blocky structure. Subsurface layers that have distinct structure and little evidence of clay accumulations may be given just a B designation. Windthorst and Selden soils have distinct Bt horizons; Lewisville and Venus soils have B horizons.

The C horizon is relatively little affected by the soil forming process, but it can be material modified by weathering.

A R horizon is underlying consolidated bedrock, such as sandstone or limestone.

Classification of Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and revised later (*6*). The system currently used by the National Cooperative Soil Survey was adopted in 1965 (*8*). It is under continual study. Readers interested in the development of the system should refer to the latest literature available (*5*).

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 6 shows the classification of each soil series of Erath County by family, subgroup, and order, according to the current system.

Climate [5]

Erath County has a warm-temperate, permanently humid climate characterized by hot summers. Tropical maritime air masses predominate throughout spring, summer, and fall. Polar air masses take over during the winter and provide a continental type climate marked by extreme variations in temperature. Average annual temperature is 64.3° F., as shown in table 7. Total annual precipitation averages 29.17 inches. Approximately three-fourths of this amount falls during the warm season, April through October. Prevailing winds are southerly the year round; they average about 13 miles per hour. The relative humidity is fairly uniform throughout the year, although slightly lower during the summer than in other seasons. Average annual relative humidity is about 80 percent at 6:00 a.m., and about 50 percent at 6:00 p.m.

Seasonal climatic changes are more easily defined than in South Texas, although not nearly so abrupt as on the High Plains. During winter Erath County experiences frequent surges of cold continental air. Cold fronts that move down from the High Plains are often accompanied by strong, gusty, northerly winds and sudden drops in temperature. Winter precipitation is usually closely associated with frontal activity. Moisture from the Gulf of Mexico is cut off rather effectively, which results in the least precipitation in winter. Occasionally, cold fronts become stationary across Central Texas. This results in prolonged periods of cold cloudy weather. During these periods, precipitation may fall as rain, freezing rain, sleet or snow.

Extremely cold weather rarely occurs before the last week in December. Snow may fall once or twice a month during the winter season but is of little or no consequence. Most snow melts almost as rapidly as it falls, and rarely is there even a small amount on the ground.

---

[5] By By ROBERT B. ORTON, State climatologist, U. S. Weather Bureau.

TABLE 6.—*Classification of soil series*

Series	Family	Subgroup	Order
Altoga	Fine-silty, carbonatic, thermic	Typic Ustochrepts	Inceptisols.
Arenosa	Siliceous, thermic, coated	Typic Quartzipsamments	Entisols.
Blanket	Fine, mixed, thermic	Pachic Argiustolls	Mollisols.
Bolar	Fine-loamy, carbonatic, thermic	Typic Calciustolls	Mollisols.
Bonti	Fine, mixed, thermic	Ultic Paleustalfs	Alfisols.
Bosque	Fine-loamy, mixed, thermic	Cumulic Haplustolls	Mollisols.
Brackett	Loamy, carbonatic, thermic, shallow	Typic Ustochrepts	Inceptisols.
Bunyan	Fine-loamy, mixed, nonacid, thermic	Typic Udifluvents	Entisols.
Chaney	Fine, mixed, thermic	Aquic Paleustalfs	Alfisols.
Crawford	Fine, montmorillonitic, thermic	Udic Chromusterts	Vertisols.
Demona	Clayey, mixed, thermic	Aquic Arenic Paleustalfs	Alfisols.
Denton	Fine, montmorillonitic, thermic	Vertic Calciustolls	Mollisols.
Duffau	Fine-loamy, siliceous, thermic	Udic Paleustalfs	Alfisols.
Dugout	Loamy, carbonatic, thermic	Lithic Ustochrepts	Inceptisols.
Exray	Clayey, mixed, thermic	Lithic Rhodustalfs	Alfisols.
Frio	Fine, mixed, thermic	Cumulic Haplustolls	Mollisols.
Gowen	Fine-loamy, mixed, thermic	Cumulic Hapludolls	Mollisols.
Hensley	Clayey, mixed, thermic	Lithic Rhodustalfs	Alfisols.
Houston Black	Fine, montmorillonitic, thermic	Udic Pellusterts	Vertisols.
Lamar	Fine-silty, mixed, thermic	Typic Ustochrepts	Inceptisols.
Lewisville	Fine-silty, mixed, thermic	Typic Calciustolls	Mollisols.
Lindy	Fine, mixed, thermic	Udic Haplustalfs	Alfisols.
Maloterre	Loamy, carbonatic, thermic	Lithic Ustorthents	Entisols.
May	Fine-loamy, mixed, thermic	Udic Haplustalfs	Alfisols.
Nimrod	Loamy, siliceous, thermic	Aquultic Arenic Paleustalfs	Alfisols.
Owens	Clayey, mixed, thermic, shallow	Typic Ustochrepts	Inceptisols.
Patilo	Loamy, siliceous, thermic	Grossarenic Paleustalfs	Alfisols.
Purves	Clayey, montmorillonitic, thermic	Lithic Calciustolls	Mollisols.
Selden	Fine-loamy, siliceous, thermic	Aquic Paleustalfs	Alfisols.
Somervell	Loamy-skeletal, carbonatic, thermic	Typic Calciustolls	Mollisols.
Thurber	Fine, montmorillonitic, thermic	Typic Haplustalfs	Alfisols.
Trinity	Fine, montmorillonitic, calcareous, thermic	Vertic Haplaquolls	Mollisols.
Truce	Fine, mixed, thermic	Udic Paleustalfs	Alfisols.
Vashti	Fine-loamy, mixed, thermic	Aquic Haplustalfs	Alfisols.
Venus	Fine-loamy, mixed, thermic	Typic Calciustolls	Mollisols.
Waurika	Fine, montmorillonitic, thermic	Aeric Argialbolls	Mollisols.
Windthorst	Fine, mixed, thermic	Udic Paleustalfs	Alfisols.

Spring is a very changeable season of the year in Erath County. During March, warm and cool spells of short duration follow each other in rapid succession. Temperature changes are sometimes quite pronounced. The cloudiness, drizzle, and light rain of the winter season decrease, but precipitation of the shower type increases. An average of about four thunderstorms occur in March, compared to only two in February. As the spring progresses, few cold fronts enter the area. Those that do cause only a short drop in temperature. Thunderstorm activity increases to an average of about six per month in both April and May. These late spring or early summer thunderstorms are sometimes accompanied by destructive hail and windstorms. March and April are the windiest months of the year.

In summer, the hot season, there are few days when the maximum temperature does not reach or exceed 90° F. Some very hot days occur in June, but frequent thundershowers, an average of about six during the month, help to break the extremely hot weather into short periods. August is the hottest month. It has an average daily maximum temperature of 95.5° F. The hottest temperatures of summer are generally associated with a fair sky, westerly wind, and very low humidity. There is little variety in the day to day weather pattern during July and August. Small thundershowers may develop in the late afternoon, but usually they dissipate by evening.

Fall is the most pleasant season of the year. Temperatures are neither extremely hot nor cold; wind velocities are the lowest of the year; and long periods of uninterrupted fair weather occur.

Warm weather continues through most of September, but temperatures are not excessive. Daily maximum temperatures reach or exceed 90° F. about one day out of every two, on an average. Rainfall increases during September and October, as weak tropical weather systems move northwestward from the Gulf of Mexico to clash with systems moving eastward from the Pacific. The weather has greater variety than in summer, yet continues mild. Thunderstorm activity gradually decreases during the fall season. The average is about four in September, three in October, and two in November. The average rainfall drops off rather sharply about the first of November.

The average freeze-free season in Erath County is 238 days. The average dates of the last 32 degree freeze in the spring and the first in the fall are March 27 and November 19 respectively. Chances are one in five that a freeze will occur after April 5 and before November 4.

Average annual lake evaporation is approximately 60 inches. Evaporation from a standard U.S. Weather Bureau four-foot pan is approximately 85 inches, of which 68 percent is lost in the period May through October. Average annual sunshine is about 70 percent of the total possible.

TABLE 7.—*Temperature*

[From records kept at the Weather Bureau Station at Stephenville,

Month	Temperature										
	Average daily maximum	Average daily minimum	Monthly average	Record high	Year of occurrence	Record low	Year of occurrence	Average number of days when maximum temperature is [1]—		Average number of days when minimum temperature is [1]—	
								90° F. or above	32° F. or below	32° F. or below	0° F. or below
	° F.	° F.	° F.	° F.		° F.					
January	55.4	32.0	43.7	84	1952 [2]	−2	1949	0	2	20	0
February	60.9	36.9	48.9	88	1954 [2]	2	1951	0	1	11	0
March	66.9	42.4	54.7	95	1954	9	1948	1	1	7	0
April	75.9	52.6	64.3	101	1963	27	1951	2	0	1	0
May	82.2	61.0	71.6	100	1955	38	1954	6	0	0	0
June	90.6	68.4	79.5	106	1959	54	1955 [2]	18	0	0	0
July	94.3	71.1	82.7	109	1954	57	1942	25	0	0	0
August	95.5	70.8	83.2	107	1943	53	1942	26	0	0	0
September	87.4	63.4	75.4	110	1953	33	1942	15	0	0	0
October	78.6	55.2	66.9	103	1951	29	1952 [2]	3	0	<0.5	0
November	66.1	41.8	54.0	87	1950	11	1950	0	0	6	0
December	57.7	35.0	46.4	88	1955	10	1963 [2]	0	1	13	0
Year	76.0	52.6	64.3	110	1953	−2	1949	96	5	58	0

[1] Length of record: 10 years.
[2] Also on earlier dates, months, or years.

Literature Cited

(1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1961. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 v., pp. 401 and 617, illus.

(2) BALDWIN, MARK, KELLOGG, CHARLES E., and THORP, JAMES.
1938. SOIL CLASSIFICATION. U.S. Dept. Agr. Ybk.: pp. 970–1001, illus.

(3) BROWN, J. B.
1963. THE ROLE OF GEOLOGY IN A UNIFIED CONSERVATION PROGRAM, FLAT TOP RANCH, BOSQUE COUNTY, TEXAS. Baylor Geol. Studies, Baylor Univ., Bul. 5.

(4) SELLARDS, E. H., ADKINS, W. S., and PLUMMER, F. B.
1932. GEOLOGY OF TEXAS. v. 1, Stratigraphy. Univ. of Tex. Bul. 3232, 1007 pp., illus.

(5) SIMONSON, ROY W.
1962. SOIL CLASSIFICATION IN THE UNITED STATES. Soil Sci. 137: 1027–1034, illus.

(6) THORP, JAMES, and SMITH, GUY D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUP. Soil Sci. 67: 117–126.

(7) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. USDA Handbk. 18, pp. 173–188. [Supplement issued May 1962]

(8) SOIL SURVEY STAFF, SCS, USDA.
1960. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 265 pp., illus. [Supplement issued March 1967 and September 1968]

(9) UNITED STATES DEPARTMENT OF DEFENSE.
1968. UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS AND FOUNDATIONS. MIL–STD–619B, 30 pp., illus.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases) that the growth of most crop plants is low from this cause.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity. The amount of water a soil can hold and make available to plants. It is the numerical difference between the percentage of water at field capacity and the percentage of water at the time the plants wilt. The rate is expressed as inches of water per inch of soil depth.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Climax vegetation. The stabilized plant community on a particular site; it reproduces itself and does not change so long as the environment does not change.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; does not hold together in a mass when dry or moist.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

and precipitation data

Erath County, Tex., 1941–63. Elevation 1,300 feet]

Precipitation												
Average total	Greatest daily	Year of occurrence	Driest year (1951)	Wettest year (1957)	One year in 10 will have— Less than—	One year in 10 will have— More than—	Average number of days when precipitation is [1]— 0.10 inch or more	0.50 inch or more	1 inch or more	Snow, sleet Average monthly	Greatest monthly	Year of occurrence
In.	*In.*		*In.*	*In.*	*In.*	*In.*				*In.*	*In.*	
1. 83	2. 74	1961	0. 14	0. 68	0. 15	3. 96	3	1	<0. 5	1. 3	5. 5	1944
1. 55	1. 70	1950	1. 56	1. 38	. 19	3. 03	4	1	<. 5	. 2	2. 5	1951
1. 45	2. 87	1945	. 95	1. 43	. 17	2. 78	2	1	0	. 2	1. 3	1947
3. 36	4. 20	1957	1. 95	10. 06	1. 39	5. 01	5	0	1	0	---	---
5. 12	9. 71	1956	3. 38	9. 69	1. 83	9. 62	6	3	1	0	---	---
2. 45	3. 32	1951	5. 00	1. 08	. 18	4. 87	5	2	1	0	---	---
2. 43	4. 60	1958	1. 36	2. 75	. 54	4. 93	4	2	2	0	---	---
1. 87	4. 44	1941	. 55	1. 00	. 23	3. 43	2	1	<. 5	0	---	---
2. 71	3. 81	1955	. 76	2. 19	. 47	5. 10	4	2	1	0	---	---
3. 12	6. 93	1959	1. 72	6. 18	. 33	6. 53	4	2	1	0	---	---
1. 66	2. 00	1946	. 53	5. 09	. 04	3. 96	3	2	<. 5	([3])	([3])	1951
1. 62	2. 22	1956	. 08	1. 38	. 16	3. 23	3	1	<. 5	. 2	1. 5	1946
29. 17	9. 71	1956	17. 98	42. 91	18. 37	38. 35	45	18	7	1. 9	5. 5	1944

[3] Trace.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Hydrologic soil groups. Groups of soils having similar rates of infiltration by water, even when wetted, and similar rates of water transmission within the soil. There are four such groups of soils currently recognized by the Soil Conservation Service.

Group A. Soils having a high infiltration rate even when thoroughly wetted, consisting chiefly of deep, well-drained to excessively drained sand, gravel, or both. These soils have a high rate of water transmission and a low runoff potential.

Group B. Soils having a moderate infiltration rate when thoroughly wetted, consisting chiefly of moderately deep to deep, moderately well drained to well drained soils of moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission and a moderate runoff potential.

Group C. Soils having a slow infiltration rate when thoroughly wetted, consisting chiefly of (1) soils with a layer that impedes the downward movement of water or (2) soils with moderately fine to fine texture and slow infiltration rate. These soils have a slow rate of water transmission and a high runoff potential.

Group D. Soils having a very slow infiltration rate when thoroughly wetted consisting chiefly of (1) clay soils with a high swelling potential; (2) soils with a high permanent water table; (3) soils with a claypan or a clay layer at or near the surface; and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission and a very high runoff potential.

Organic matter. A general term for plant and animal material, in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil type, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects management.

pH value. A numerical means for designating relatively weak acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Plow layer. The soil ordinarily moved in tillage; equivalent to surface soil.

Plowpan. A compacted layer formed in the soil immediately below the plowed layer.

Poorly graded. A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Range site. An area of range where climate, soil, and topography are sufficiently uniform to produce a distinct kind of climax vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. In other words, the degree of acidity or alkalinity are expressed thus:

Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The evaluations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Shale. A sedimentary rock formed by the hardening of clay deposits.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Stratified. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called *second bottoms*, as contrasted to *flood plains*, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

Well-graded soil. A soil or soil material consisting of particles that are well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Acreage and extent, table 1, page 6.
Estimated yields, table 2, page 45.
Use of soils for engineering, tables 3, 4, and 5, pages 56 through 73.

Map symbol	Mapping unit	Described on page	Capability unit		Range site	
			Symbol	Page	Name	Page
AaD3	Altoga clay loam, 1 to 8 percent slopes, severely eroded	7	VIe-1	43	Deep Upland	48
AdE2	Altoga-Duffau complex, 3 to 20 percent slopes, eroded	7	VIe-1	43	Deep Upland	48
AlD2	Altoga-Lewisville clay loams, 5 to 8 percent slopes, eroded	7	IVe-1	42	Deep Upland	48
BaA	Blanket clay loam, 0 to 1 percent slopes	8	I-1	40	Deep Upland	48
BaB	Blanket clay loam, 1 to 3 percent slopes	8	IIe-1	40	Deep Upland	48
BaC3	Blanket clay loam, 1 to 5 percent slopes, severely eroded	8	VIe-1	43	Deep Upland	48
BcC2	Bolar clay loam, 3 to 5 percent slopes, eroded	9	IIIe-1	41	Deep Upland	48
BdC	Bolar-Denton complex, 3 to 5 percent slopes	9	IIIe-1	41	Deep Upland	48
Be	Bonti-Exray stony fine sandy loams	10	VIe-5	44	Sandy Loam	48
Bo	Bosque loam, occasionally flooded	11	I-1	40	Bottomland	49
BrF	Brackett-Dugout complex, 8 to 40 percent slopes	12	VIIs-1	44	Limestone Hills	49
Bt	Brackett-Purves complex	12	VIIs-1	44	Limestone Hills	49
Bu	Bunyan fine sandy loam, occasionally flooded	13	I-1	40	Bottomland	49
By	Bunyan soils, frequently flooded	13	Vw-1	43	Bottomland	49
ChC	Chaney loamy sand, 1 to 5 percent slopes	14	IIIe-3	41	Sandy	51
Cn	Chaney stony loamy sand	14	VIe-4	44	Sandy	51
CoC2	Chaney soils, 1 to 5 percent slopes, eroded	14	IVe-5	43	Sandy Loam	48
CrB	Crawford clay, 1 to 3 percent slopes	15	IIe-2	40	Redland	52
DaC	Demona loamy sand, 0 to 5 percent slopes	15	IIIe-4	41	Sandy	51
DeB	Denton silty clay, 1 to 3 percent slopes	16	IIe-1	40	Deep Upland	48
DfA	Duffau fine sandy loam, 0 to 1 percent slopes	17	I-2	40	Sandy Loam	48
DfB	Duffau fine sandy loam, 1 to 3 percent slopes	17	IIe-3	40	Sandy Loam	48
DfC	Duffau fine sandy loam, 3 to 5 percent slopes	17	IIIe-2	41	Sandy Loam	48
DlC	Duffau loamy fine sand, 0 to 5 percent slopes	18	IIIe-3	41	Sandy	51
DuC2	Duffau soils, 2 to 5 percent slopes, eroded	18	IIIe-2	41	Sandy Loam	48
DuD	Duffau soils, 5 to 8 percent slopes	18	IVe-4	43	Sandy Loam	48
DuD3	Duffau soils, 2 to 8 percent slopes, severely eroded	18	VIe-2	43	Sandy Loam	48
Fr	Frio clay loam, occasionally flooded	20	I-1	40	Bottomland	49
Go	Gowen clay loam, occasionally flooded	20	I-1	40	Bottomland	49
Gu	Gullied land 1/	20	VIIe-1	44	----------------	
HeB	Hensley loam, 1 to 3 percent slopes	21	IIIe-5	42	Redland	52
Hn	Hensley stony loam	21	VIs-1	44	Redland	52
HoA	Houston Black clay, 0 to 1 percent slopes	22	IIs-1	41	Deep Upland	48
HoB	Houston Black clay, 1 to 3 percent slopes	22	IIe-2	40	Deep Upland	48
LaB	Lamar loam, 1 to 3 percent slopes	23	IIIe-1	41	Rolling Prairie	47
LaC	Lamar loam, 3 to 5 percent slopes	23	IVe-1	42	Rolling Prairie	47
LeB	Lewisville clay loam, 1 to 3 percent slopes	24	IIe-1	40	Deep Upland	48
LeC	Lewisville clay loam, 3 to 5 percent slopes	24	IIIe-1	41	Deep Upland	48
LgC2	Lewisville-Altoga clay loams, 3 to 5 percent slopes, eroded	24	IIIe-1	41	Deep Upland	48
LnB	Lindy fine sandy loam, 1 to 3 percent slopes	24	IIe-3	40	Sandy Loam	48
LnB2	Lindy fine sandy loam, 1 to 3 percent slopes, eroded	24	IIIe-2	41	Sandy Loam	48
LyB	Lindy loam, 1 to 3 percent slopes	24	IIe-1	40	Redland	52
Ma	Maloterre soils	25	VIIs-1	44	Very Shallow	52
MfA	May fine sandy loam, 0 to 1 percent slopes	26	I-2	40	Sandy Loam	48
MfB	May fine sandy loam, 1 to 3 percent slopes	26	IIe-3	40	Sandy Loam	48

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page	Range site Name	Range site Page
Mn	Mine dumps	26	------	--	-----------------	
NdC	Nimrod fine sand, 0 to 5 percent slopes	26	IIIe-4	41	Sandy	51
NpB	Nimrod-Arenosa-Patilo fine sands, 0 to 3 percent slopes	27	IVe-6	43	Deep Sandy	52
NpD	Nimrod-Arenosa-Patilo fine sands, 3 to 8 percent slopes	27	VIe-3	44	Deep Sandy	52
OwE	Owens stony clay, 3 to 20 percent slopes	28	VIIe-2	44	Shaly Hills	51
PcB	Purves clay, 1 to 3 percent slopes	30	IIIe-5	42	Rolling Prairie	47
PcC	Purves clay, 3 to 5 percent slopes	30	IVe-2	42	Rolling Prairie	47
Pd	Purves-Dugout complex	30	VIs-1	44	Rolling Prairie	47
Sa	Sandy alluvial land 1/	30	Vw-1	43	Bottomland	49
SdC	Selden fine sand, 1 to 5 percent slopes	31	IIIe-3	41	Sandy	51
SeC2	Selden soils, 1 to 5 percent slopes, eroded	31	IVe-5	43	Sandy	51
Sm	Somervell-Maloterre complex	31	VIIs-1	44	Rolling Prairie	47
Tk	Thurber and Waurika soils 1/	32	IIIe-6	42	Tightland	52
Tn	Trinity clay, occasionally flooded	33	IIs-1	41	Bottomland	49
TrC	Truce fine sandy loam, 1 to 5 percent slopes 1/	33	IIIe-6	42	Sandy Loam	48
TuF	Truce stony fine sandy loam, 5 to 40 percent slopes	34	VIe-5	44	Sandstone Hills	50
VaB	Vashti loamy fine sand, 1 to 3 percent slopes	34	IIIe-3	41	Sandy	51
Vh	Vashti stony loamy fine sand	34	VIe-4	44	Sandy	51
ViA	Venus loam, 0 to 1 percent slopes, occasionally flooded	35	I-1	40	Deep Upland	48
VlB	Venus loam, 1 to 3 percent slopes	36	IIe-1	40	Deep Upland	48
VlC	Venus loam, 3 to 5 percent slopes	36	IIIe-1	41	Deep Upland	48
WaA	Waurika fine sandy loam, 0 to 1 percent slopes	36	IIs-2	41	Tightland	52
WaB	Waurika fine sandy loam, 1 to 3 percent slopes	36	IIIe-6	42	Tightland	52
WaB2	Waurika fine sandy loam, 1 to 3 percent slopes, eroded	36	IVe-3	42	Tightland	52
WkA	Waurika fine sandy loam, thick surface, 0 to 2 percent slopes	36	IIs-2	41	Sandy Loam	48
WnC	Windthorst loamy very fine sand, 1 to 5 percent slopes	38	IIIe-3	41	Sandy	51
WoB	Windthorst fine sandy loam, 1 to 3 percent slopes	37	IIe-3	40	Sandy Loam	48
WoB2	Windthorst fine sandy loam, 1 to 3 percent slopes, eroded	37	IIIe-2	41	Sandy Loam	48
WoC	Windthorst fine sandy loam, 3 to 5 percent slopes	37	IIIe-2	41	Sandy Loam	48
WoD	Windthorst fine sandy loam, 5 to 8 percent slopes	38	IVe-4	43	Sandy Loam	48
WsC2	Windthorst soils, 3 to 5 percent slopes, eroded	38	IVe-4	43	Sandy Loam	48
WsD3	Windthorst soils, 1 to 8 percent slopes, severely eroded	38	VIe-2	43	Sandy Loam	48

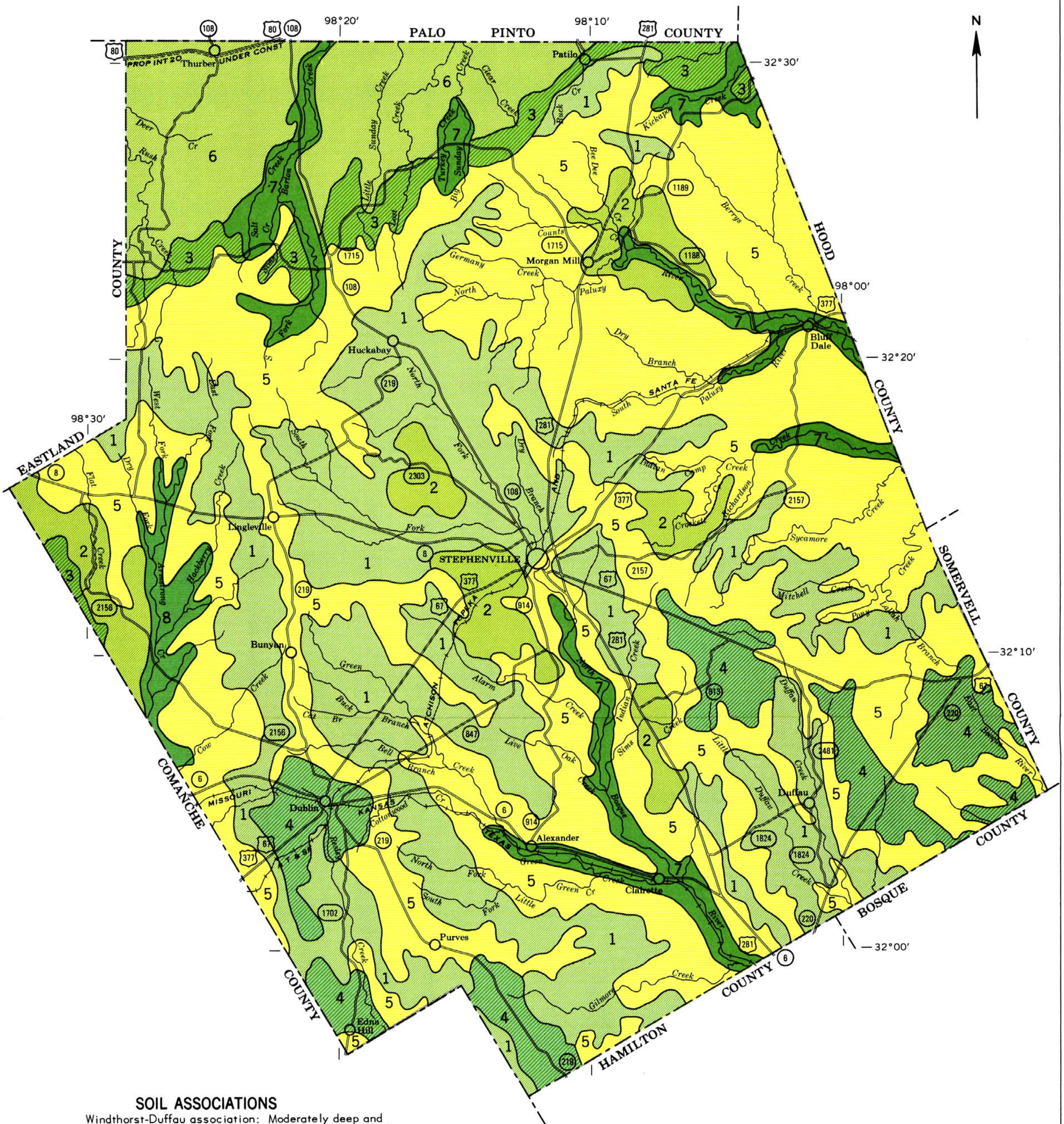
1/ These are low intensity mapping units. Their composition is more variable than that of other mapping units in the county but has been controlled well enough that interpretations can be made on their expected use.

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all of its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, political beliefs, genetic information, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

To file a complaint of discrimination, write to USDA, Assistant Secretary for Civil Rights, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, S.W., Stop 9410, Washington, DC 20250-9410, or call toll-free at (866) 632-9992 (English) or (800) 877-8339 (TDD) or (866) 377-8642 (English Federal-relay) or (800) 845-6136 (Spanish Federal-relay). USDA is an equal opportunity provider and employer.



SOIL ASSOCIATIONS

1 — Windthorst-Duffau association: Moderately deep and deep, gently sloping to sloping, sandy and loamy soils that have reddish, loamy and clayey layers in the lower part

2 — Nimrod-Selden association: Deep, nearly level to sloping, sandy soils that have mottled, loamy layers in the lower part

3 — Chaney-Demona association: Deep, nearly level to sloping, sandy soils that have mottled, clayey layers in the lower part

4 — Houston Black-Denton-Purves association: Nearly level to gently sloping, clayey soils that are deep to shallow over limestone and marl

5 — Maloterre-Purves-Dugout association: Stony and gravelly soils that are shallow to very shallow over limestone

6 — Truce-Bonti-Owens association: Stony soils that are dominantly moderately deep to shallow over shale and sandstone

7 — Frio-Venus-Bosque association: Deep, nearly level to gently sloping, calcareous, loamy soils on flood plains and stream terraces

8 — Duffau-Bunyan association: Deep, nearly level to gently sloping, loamy soils

Published 1972

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TEXAS AGRICULTURAL EXPERIMENT STATION

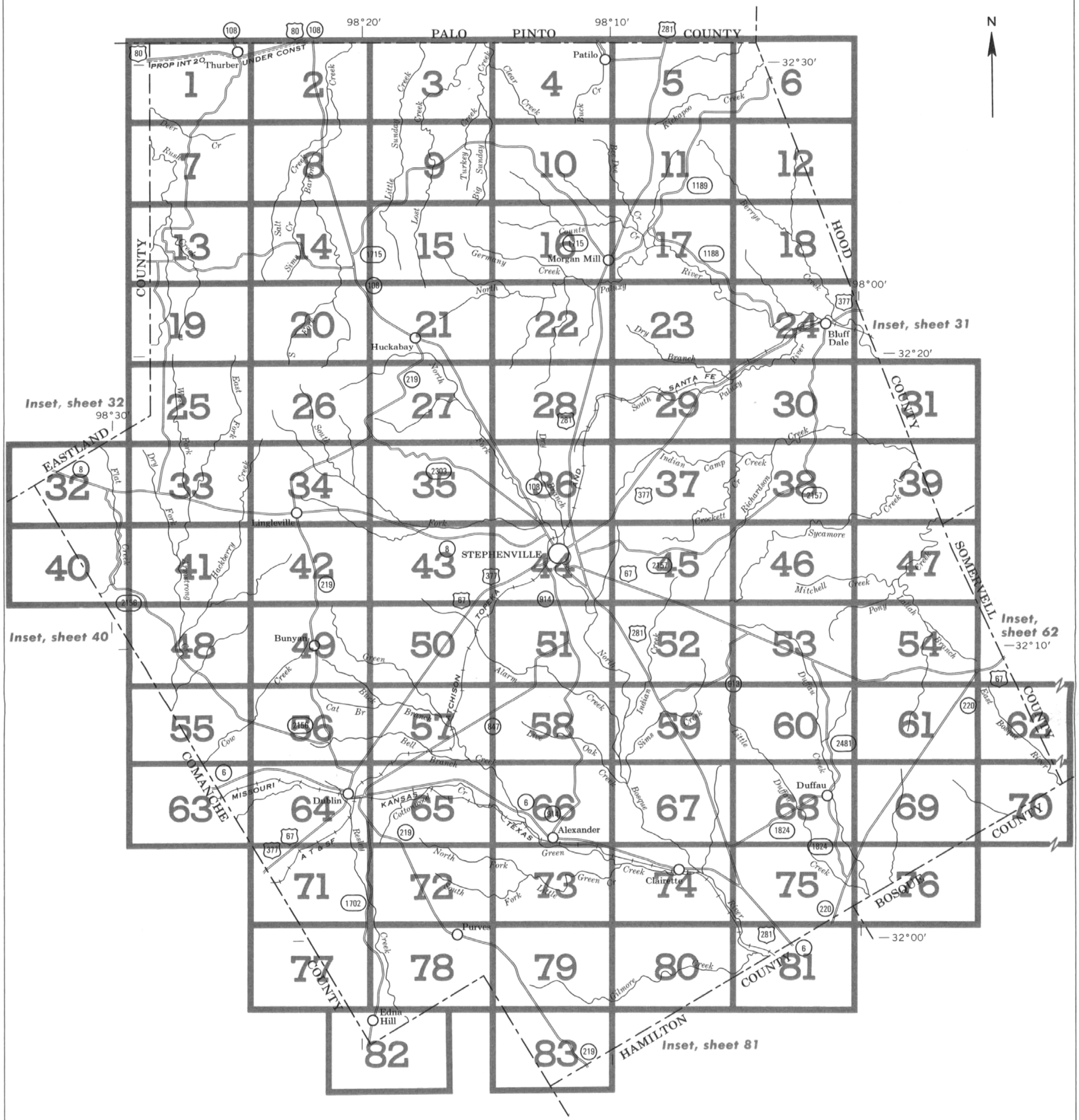
GENERAL SOIL MAP

ERATH COUNTY, TEXAS

Scale 1:253 440

1 0 1 2 3 4 Miles

This map is for general planning. It shows only the major soils and does not contain sufficient detail for operational planning.



INDEX TO MAP SHEETS

ERATH COUNTY, TEXAS

Scale 1:253 440

1 0 1 2 3 4 Miles

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are those of nearly level soils or land types, but some are for soils or land types that have a considerable range in slope. The number, 2 or 3, in a symbol shows that the soil is eroded or severely eroded.

SYMBOL	NAME
AaD3	Altoga clay loam, 1 to 8 percent slopes, severely eroded
AdE2	Altoga-Duffau complex, 3 to 20 percent slopes, eroded
AlD2	Altoga-Lewisville clay loams, 5 to 8 percent slopes, eroded
BaA	Blanket clay loam, 0 to 1 percent slopes
BaB	Blanket clay loam, 1 to 3 percent slopes
BaC3	Blanket clay loam, 1 to 5 percent slopes, severely eroded
BcC2	Bolar clay loam, 3 to 5 percent slopes, eroded
BdC	Bolar-Denton complex, 3 to 5 percent slopes
Be	Bonti-Exray stony fine sandy loams
Bo	Bosque loam, occasionally flooded
BrF	Brackett-Dugout complex, 8 to 40 percent slopes
Bt	Brackett-Purves complex
Bu	Bunyan fine sandy loam, occasionally flooded
By	Bunyan soils, frequently flooded
ChC	Chaney loamy sand, 1 to 5 percent slopes
Cn	Chaney stony loamy sand
CoC2	Chaney soils, 1 to 5 percent slopes, eroded
CrB	Crawford clay, 1 to 3 percent slopes
DaC	Demona loamy sand, 0 to 5 percent slopes
DeB	Denton silty clay, 1 to 3 percent slopes
DfA	Duffau fine sandy loam, 0 to 1 percent slopes
DfB	Duffau fine sandy loam, 1 to 3 percent slopes
DfC	Duffau fine sandy loam, 3 to 5 percent slopes
DlC	Duffau loamy fine sand, 0 to 5 percent slopes
DuC2	Duffau soils, 2 to 5 percent slopes, eroded
DuD	Duffau soils, 5 to 8 percent slopes
DuD3	Duffau soils, 2 to 8 percent slopes, severely eroded
Fr	Frio clay loam, occasionally flooded
Go	Gowen clay loam, occasionally flooded
Gu	Gullied land
HeB	Hensley loam, 1 to 3 percent slopes
Hn	Hensley stony loam
HoA	Houston Black clay, 0 to 1 percent slopes
HoB	Houston Black clay, 1 to 3 percent slopes
LaB	Lamar loam, 1 to 3 percent slopes
LaC	Lamar loam, 3 to 5 percent slopes
LeB	Lewisville clay loam, 1 to 3 percent slopes
LeC	Lewisville clay loam, 3 to 5 percent slopes
LgC2	Lewisville-Altoga clay loams, 3 to 5 percent slopes, eroded
LnB	Lindy fine sandy loam, 1 to 3 percent slopes
LnB2	Lindy fine sandy loam, 1 to 3 percent slopes, eroded
LyB	Lindy loam, 1 to 3 percent slopes
Ma	Maloterre soils
MfA	May fine sandy loam, 0 to 1 percent slopes
MfB	May fine sandy loam, 1 to 3 percent slopes
Mn	Mine dumps
NdC	Nimrod fine sand, 0 to 5 percent slopes
NpB	Nimrod-Arenosa-Patilo fine sands, 0 to 3 percent slopes
NpD	Nimrod-Arenosa-Patilo fine sands, 3 to 8 percent slopes
OwE	Owens stony clay, 3 to 20 percent slopes
PcB	Purves clay, 1 to 3 percent slopes
PcC	Purves clay, 3 to 5 percent slopes
Pd	Purves-Dugout complex
Sa	Sandy alluvial land
SdC	Selden fine sand, 1 to 5 percent slopes
SeC2	Selden soils, 1 to 5 percent slopes, eroded
Sm	Somervell-Maloterre complex
Tk	Thurber and Waurika soils
Tn	Trinity clay, occasionally flooded
TrC	Truce fine sandy loam, 1 to 5 percent slopes
TuF	Truce stony fine sandy loam, 5 to 40 percent slopes
VaB	Vashti loamy fine sand, 1 to 3 percent slopes
Vh	Vashti stony loamy fine sand
VlA	Venus loam, 0 to 1 percent slopes, occasionally flooded
VlB	Venus loam, 1 to 3 percent slopes
VlC	Venus loam, 3 to 5 percent slopes
WaA	Waurika fine sandy loam, 0 to 1 percent slopes
WaB	Waurika fine sandy loam, 1 to 3 percent slopes
WaB2	Waurika fine sandy loam, 1 to 3 percent slopes, eroded
WkA	Waurika fine sandy loam, thick surface, 0 to 2 percent slopes
WnC	Windthorst loamy very fine sand, 1 to 5 percent slopes
WoB	Windthorst fine sandy loam, 1 to 3 percent slopes
WoB2	Windthorst fine sandy loam, 1 to 3 percent slopes, eroded
WoC	Windthorst fine sandy loam, 3 to 5 percent slopes
WoD	Windthorst fine sandy loam, 5 to 8 percent slopes
WsC2	Windthorst soils, 3 to 5 percent slopes, eroded
WsD3	Windthorst soils, 1 to 8 percent slopes, severely eroded

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Tunnel

Buildings
- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Windmill

BOUNDARIES

- National or state
- County
- Reservation
- Land grant
- Small park, cemetery, airport

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

Canals and ditches (CANAL)

Lakes and ponds
- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness: Stony; Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Short steep slope

ERATH COUNTY, TEXAS — SHEET NUMBER 1

1

ERATH COUNTY, TEXAS NO. 1

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

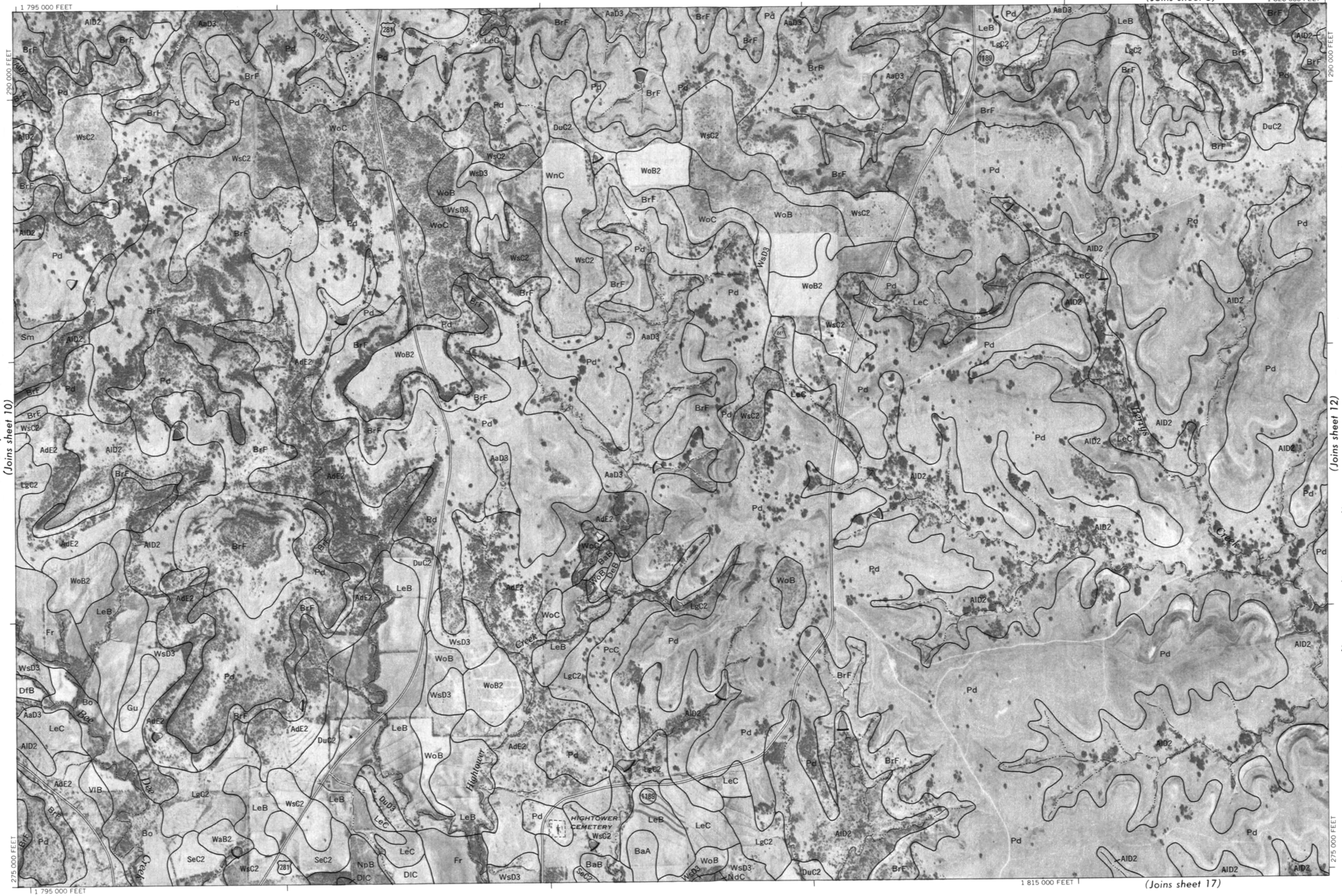
10

ERATH COUNTY, TEXAS — SHEET NUMBER 10

ERATH COUNTY, TEXAS NO. 10

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 11



This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

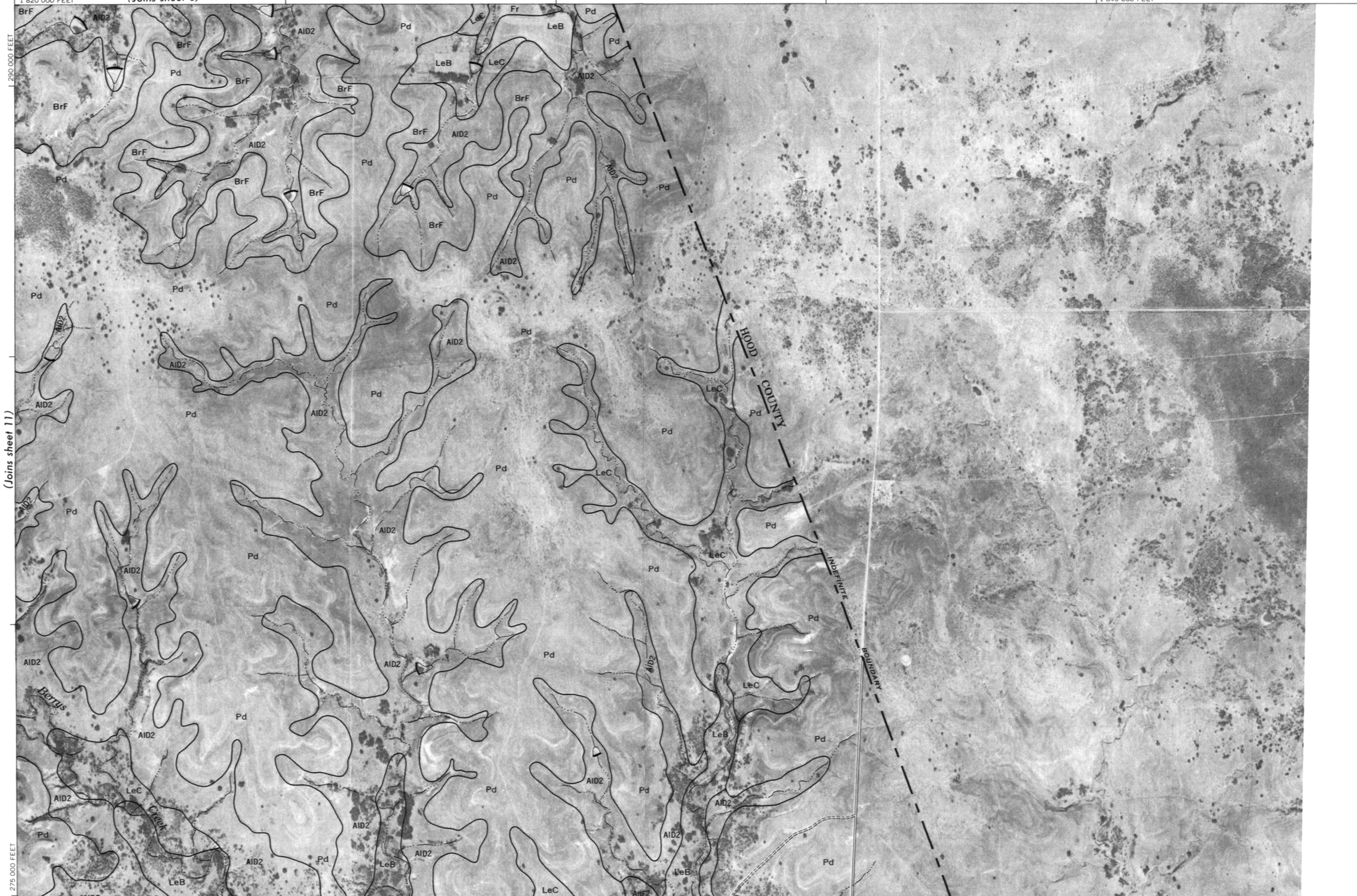
N

Scale 1:20000
1 Mile | 5000 Feet

ERATH COUNTY, TEXAS — SHEET NUMBER 12

N

(Joins sheet 6)



(Joins sheet 18)

(Joins sheet 11)

Scale 1:20000

1 Mile
0 ¼ ½ ¾ 1

5000 Feet
0 1000 2000 3000 4000 5000

ERATH COUNTY, TEXAS NO. 12

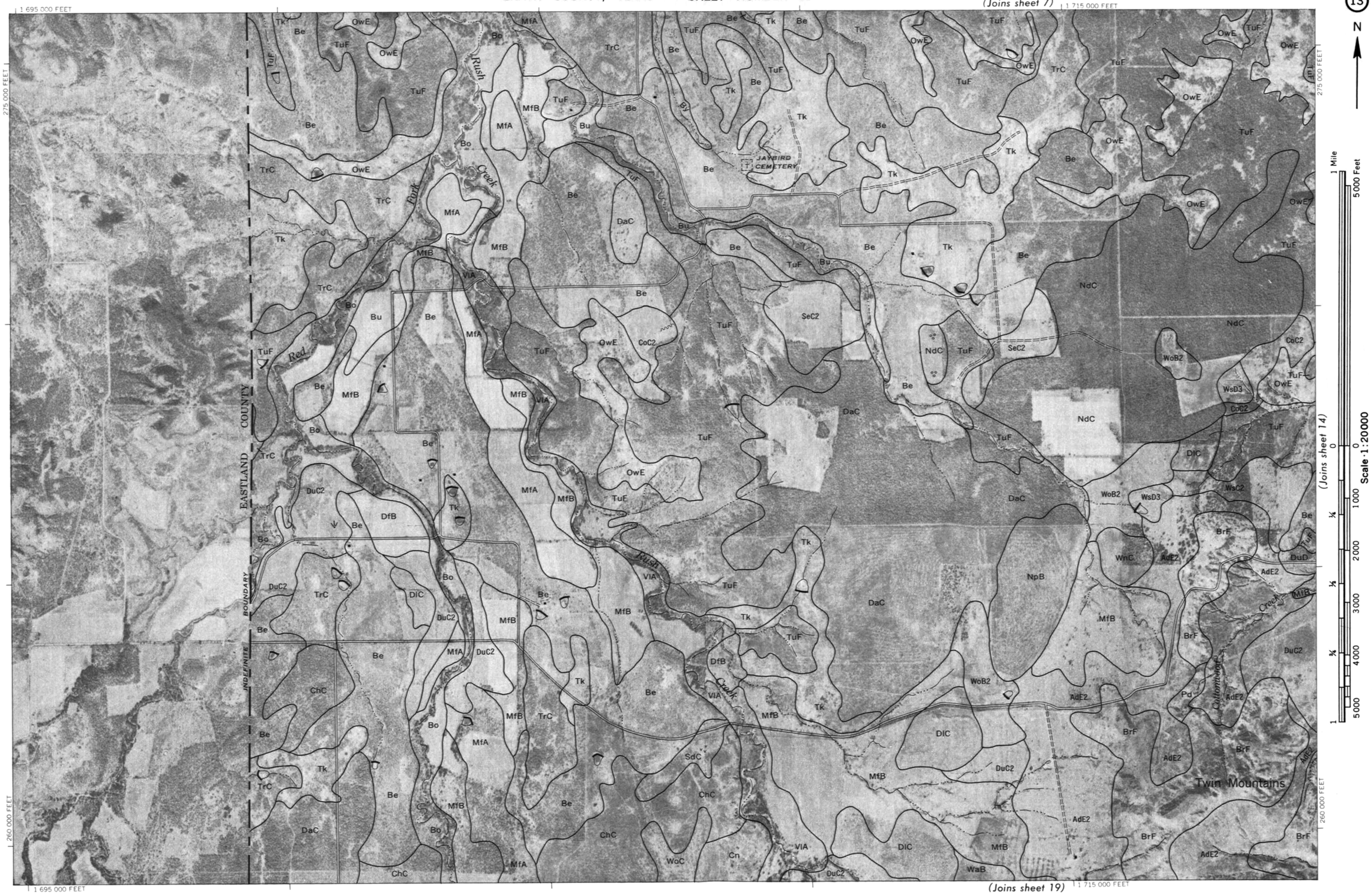
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 13

(13)

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS NO. 13



ERATH COUNTY, TEXAS — SHEET NUMBER 14

14

(Joins sheet 8)

N

Scale 1:20000

1 Mile

5000 Feet

(Joins sheet 20)

ERATH COUNTY, TEXAS NO. 14

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 15

(15)

(Joins sheet 9)

1 745 000 FEET

1 765 000 FEET

1 745 000 FEET

1 765 000 FEET

(Joins sheet 21)

ERATH COUNTY, TEXAS NO. 15
(Joins sheet 14)

(Joins sheet 16)

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

N

1 Mile
5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

ERATH COUNTY, TEXAS — SHEET NUMBER 16

ERATH COUNTY, TEXAS NO. 16

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 17

17

N

Scale 1:20000

1 Mile
0 ¼ ½ ¾ 1
5000 Feet
0 1000 2000 3000 4000 5000

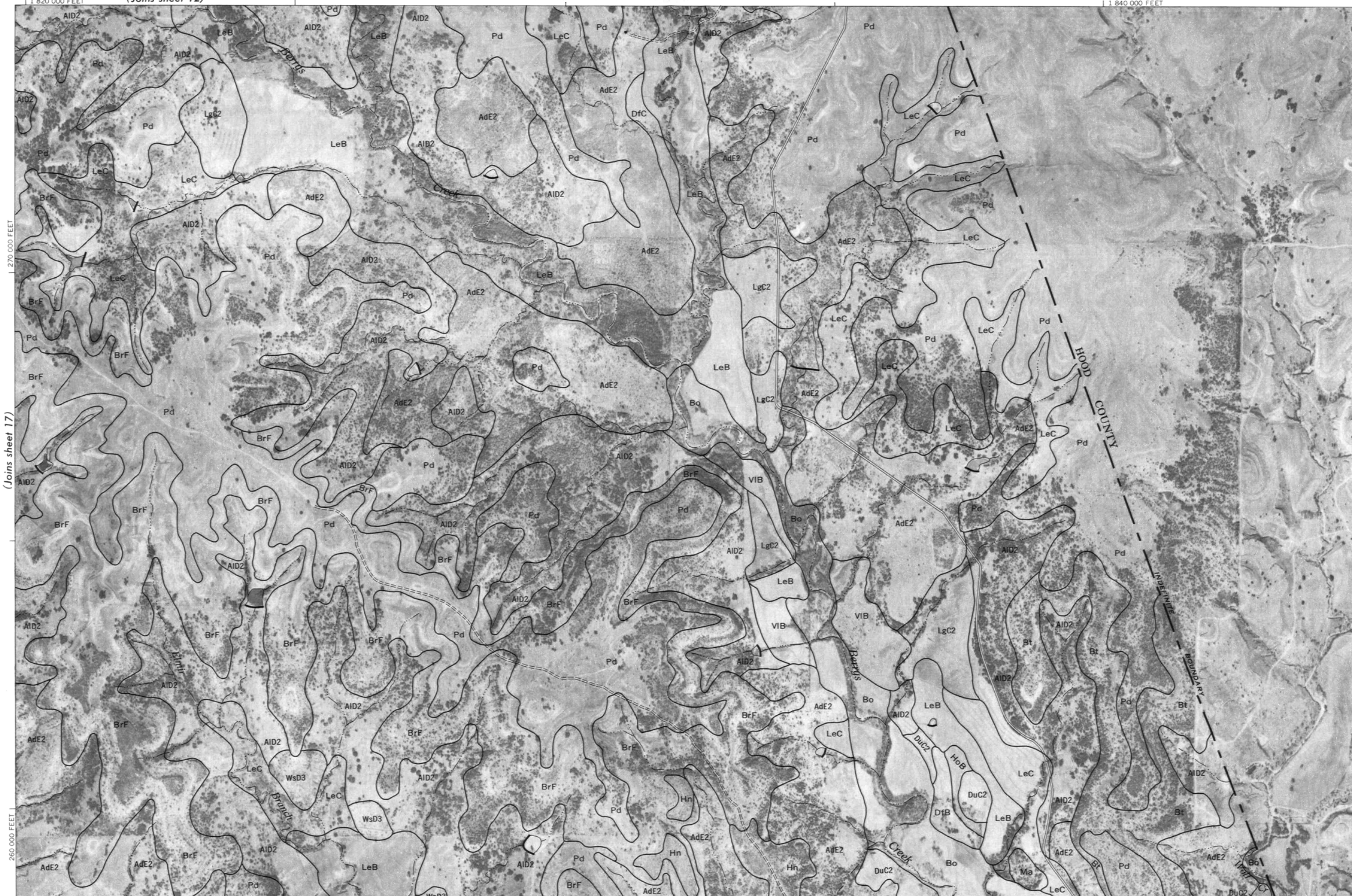
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

(18)

ERATH COUNTY, TEXAS — SHEET NUMBER 18

(Joins sheet 12)



(Joins sheet 24)

N

1 Mile

5000 Feet

Scale 1:20000

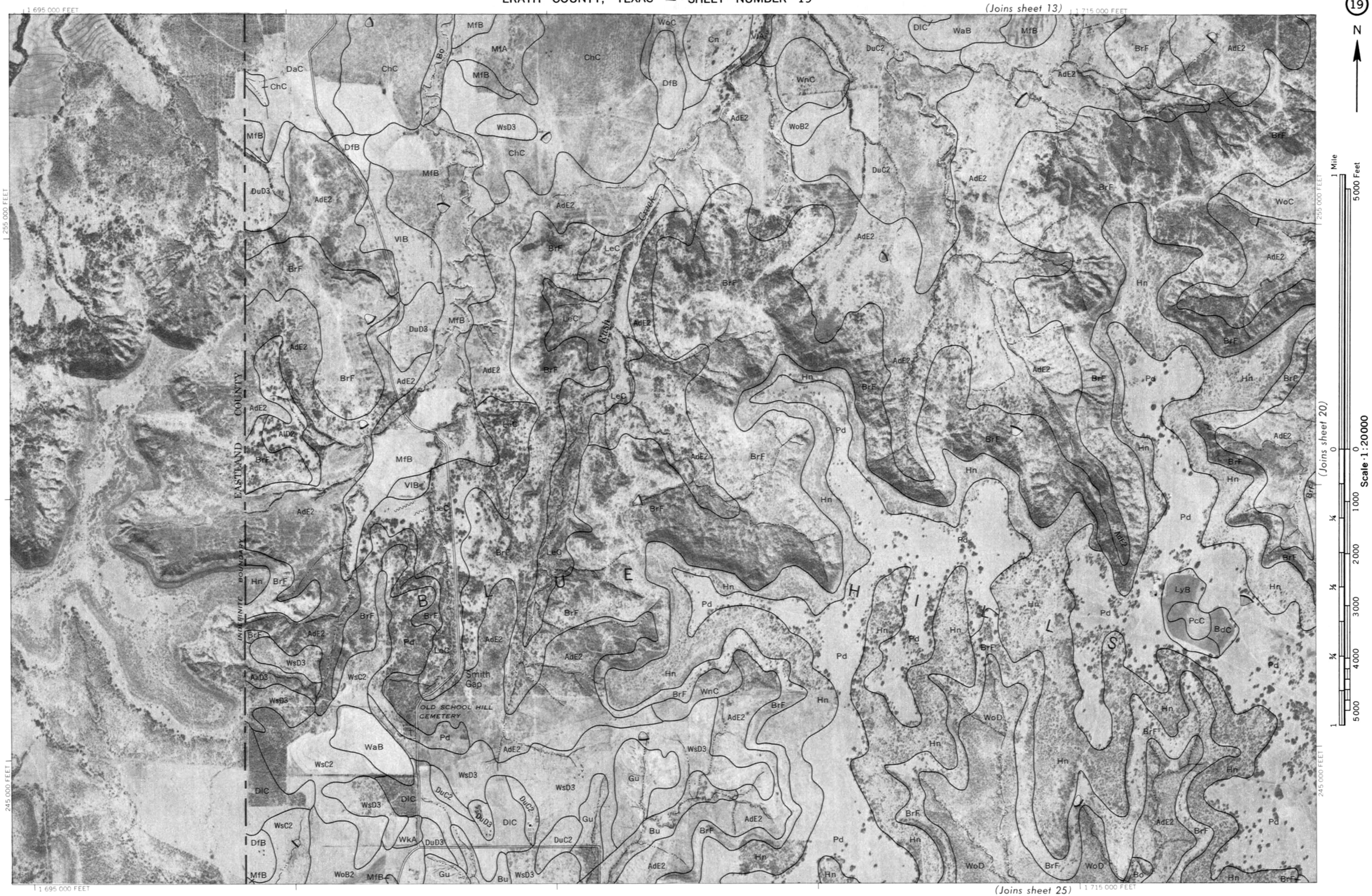
0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

ERATH COUNTY, TEXAS NO. 18

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

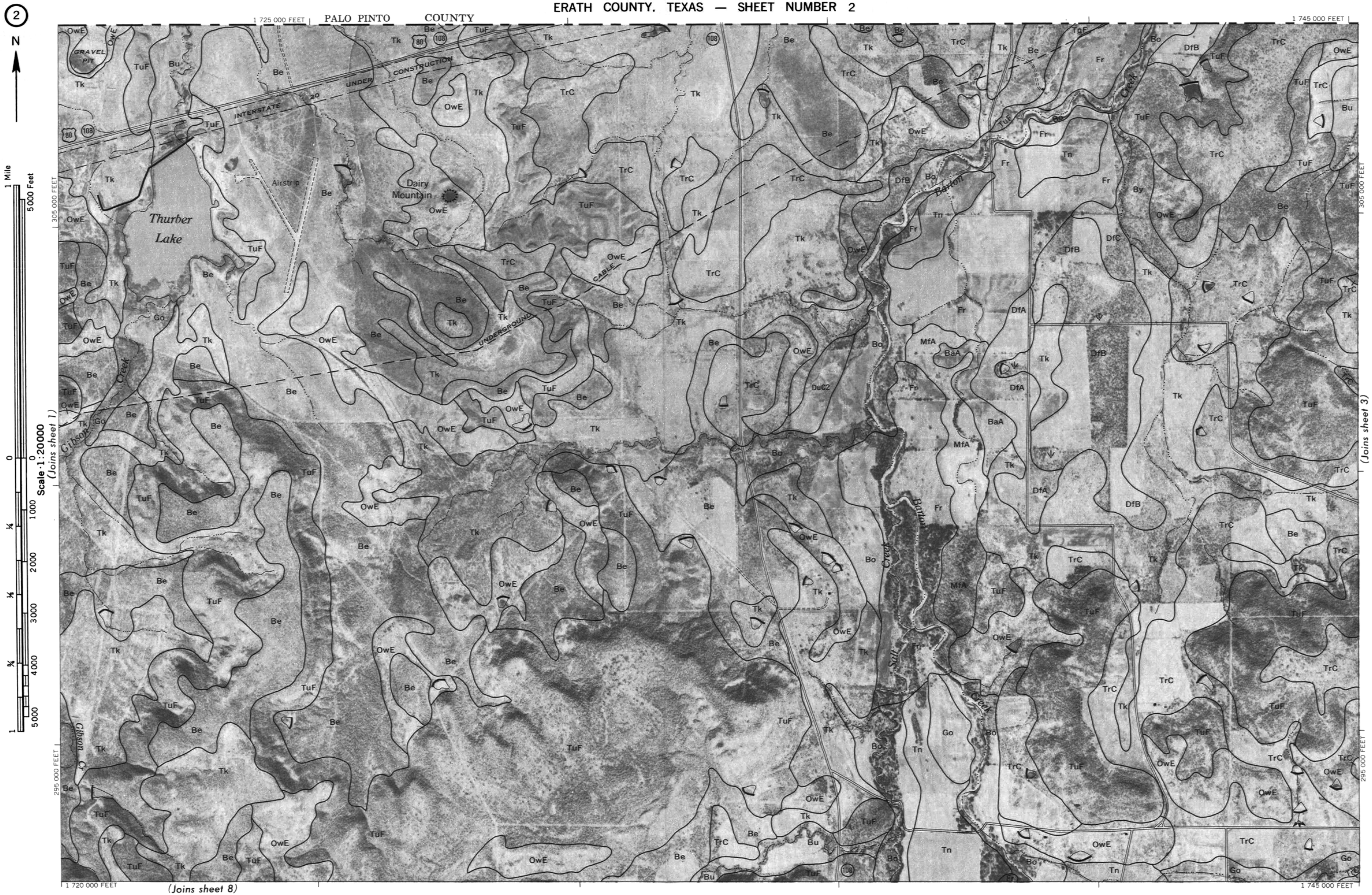
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.



ERATH COUNTY, TEXAS NO. 19

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 2



ERATH COUNTY, TEXAS NO. 2

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

20

N

(Joins sheet 14)

(Joins sheet 19)

(Joins sheet 21)

(Joins sheet 26)

1 Mile
5000 Feet
Scale 1:20000

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS NO. 20

ERATH COUNTY, TEXAS — SHEET NUMBER 21

21

(Joins sheet 15)

(Joins sheet 22)

(Joins sheet 27)

ERATH COUNTY, TEXAS NO. 21
(Joins sheet 20)

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 22

ERATH COUNTY, TEXAS NO. 22

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 23

23

N

(Joins sheet 17)

1 795 000 FEET

1 815 000 FEET

ERATH COUNTY, TEXAS NO. 23
(Joins sheet 22)

255 000 FEET

245 000 FEET

(Joins sheet 24)

(Joins sheet 29)

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

1 Mile
5000 Feet
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000
Scale 1:20000

ERATH COUNTY, TEXAS — SHEET NUMBER 24

ERATH COUNTY, TEXAS NO. 24

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

N

Scale 1:20000

1 Mile, ¾, ½, ¼, 0

5000 Feet, 4000, 3000, 2000, 1000, 0

ERATH COUNTY, TEXAS NO. 25

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station. Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 26

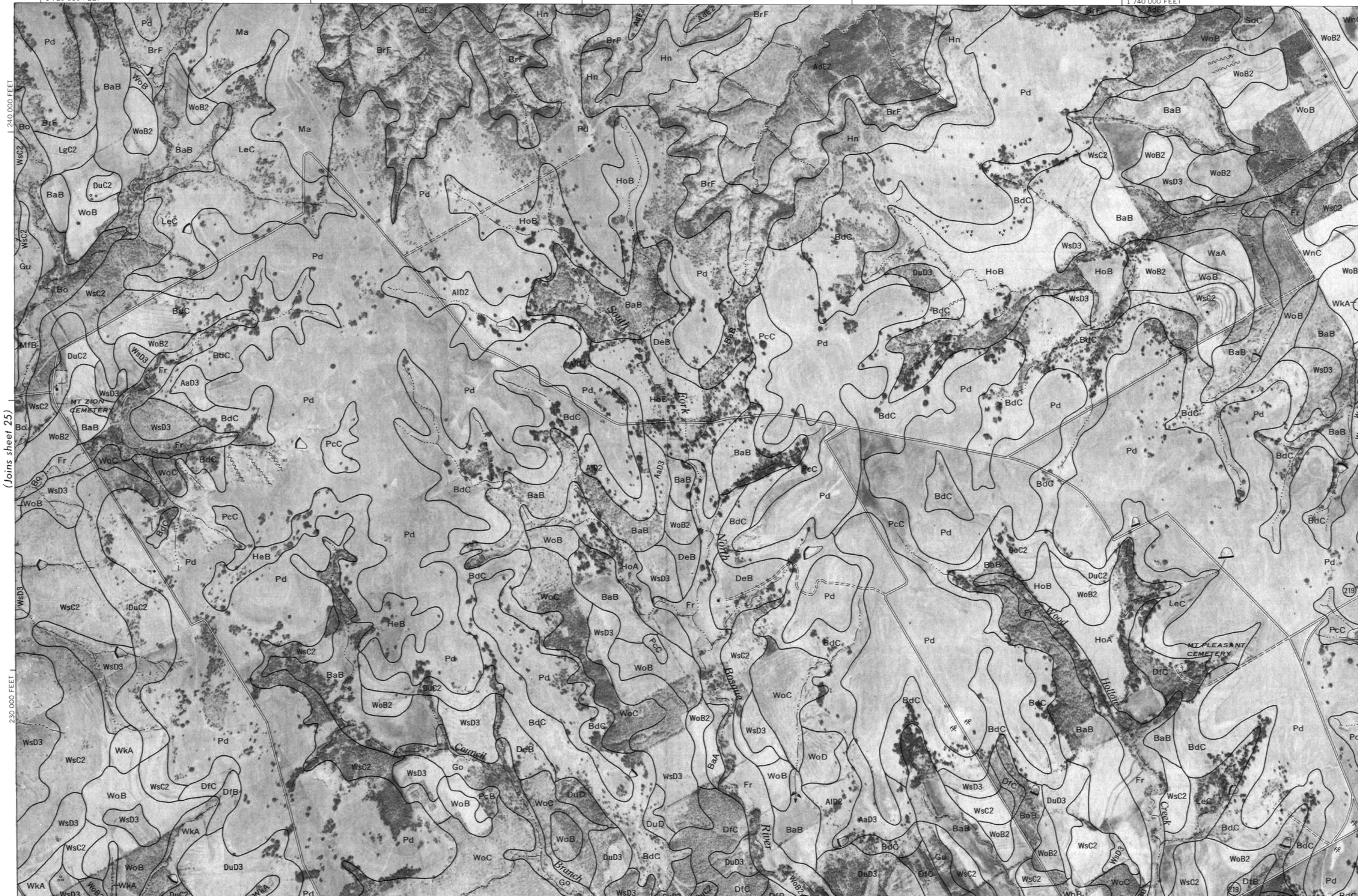
N

1 Mile
5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

1 720 000 FEET (Joins sheet 20) 1 740 000 FEET



1 720 000 FEET (Joins sheet 34) 1 740 000 FEET

ERATH COUNTY, TEXAS NO. 26

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS NO. 27
(Joins sheet 26)

ERATH COUNTY, TEXAS — SHEET NUMBER 28

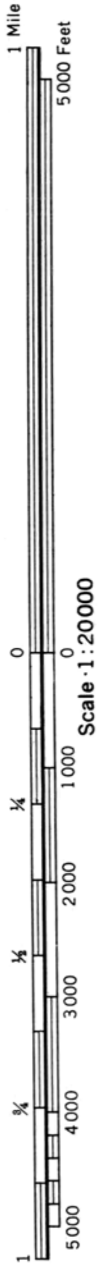
(Joins sheet 22)

N

1 Mile

5000 Feet

Scale 1:20000



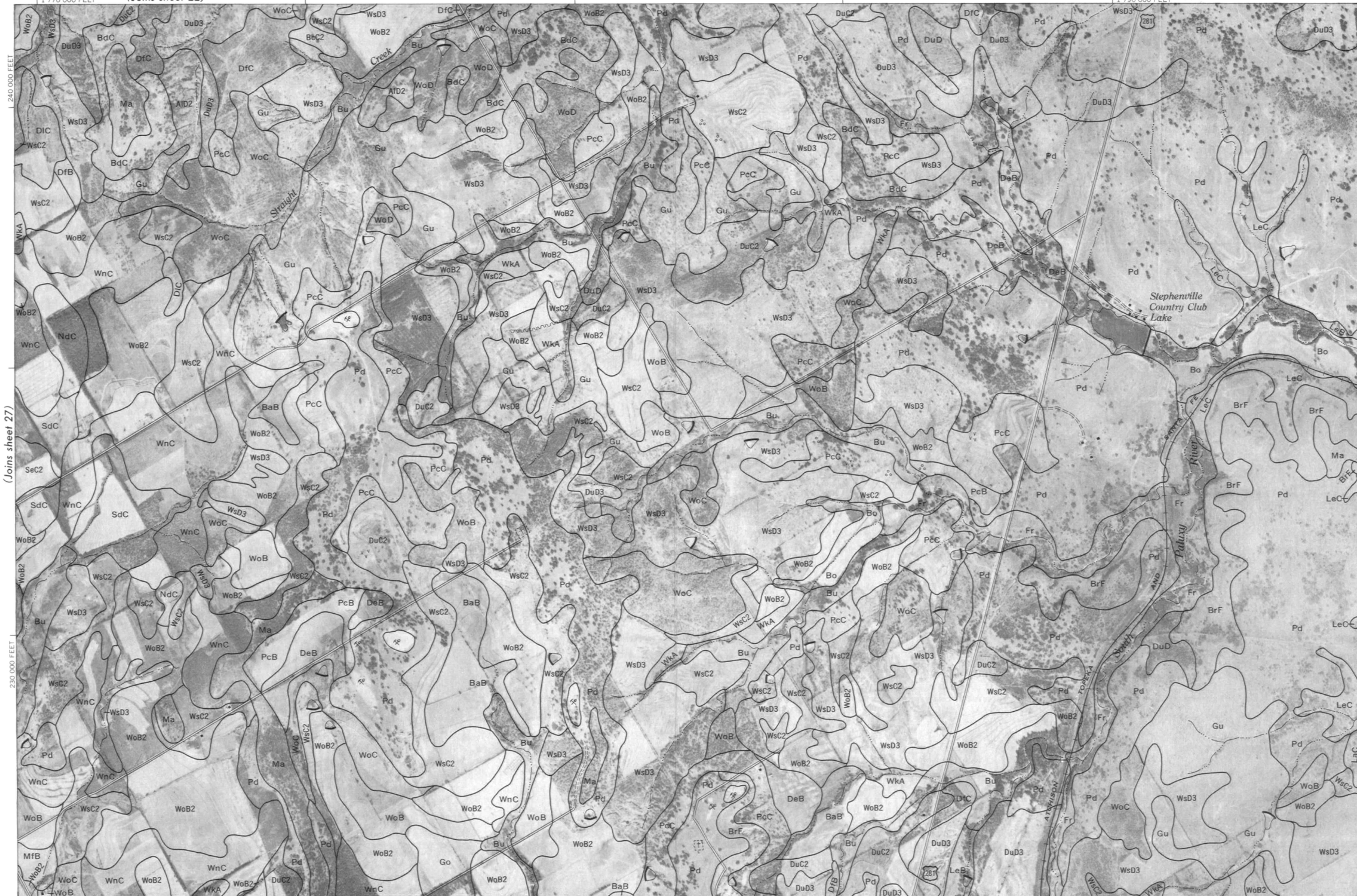
(Joins sheet 27)

1 770 000 FEET

1 790 000 FEET

240 000 FEET

230 000 FEET



(Joins sheet 29)

(Joins sheet 36)

108

ERATH COUNTY, TEXAS NO. 28

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

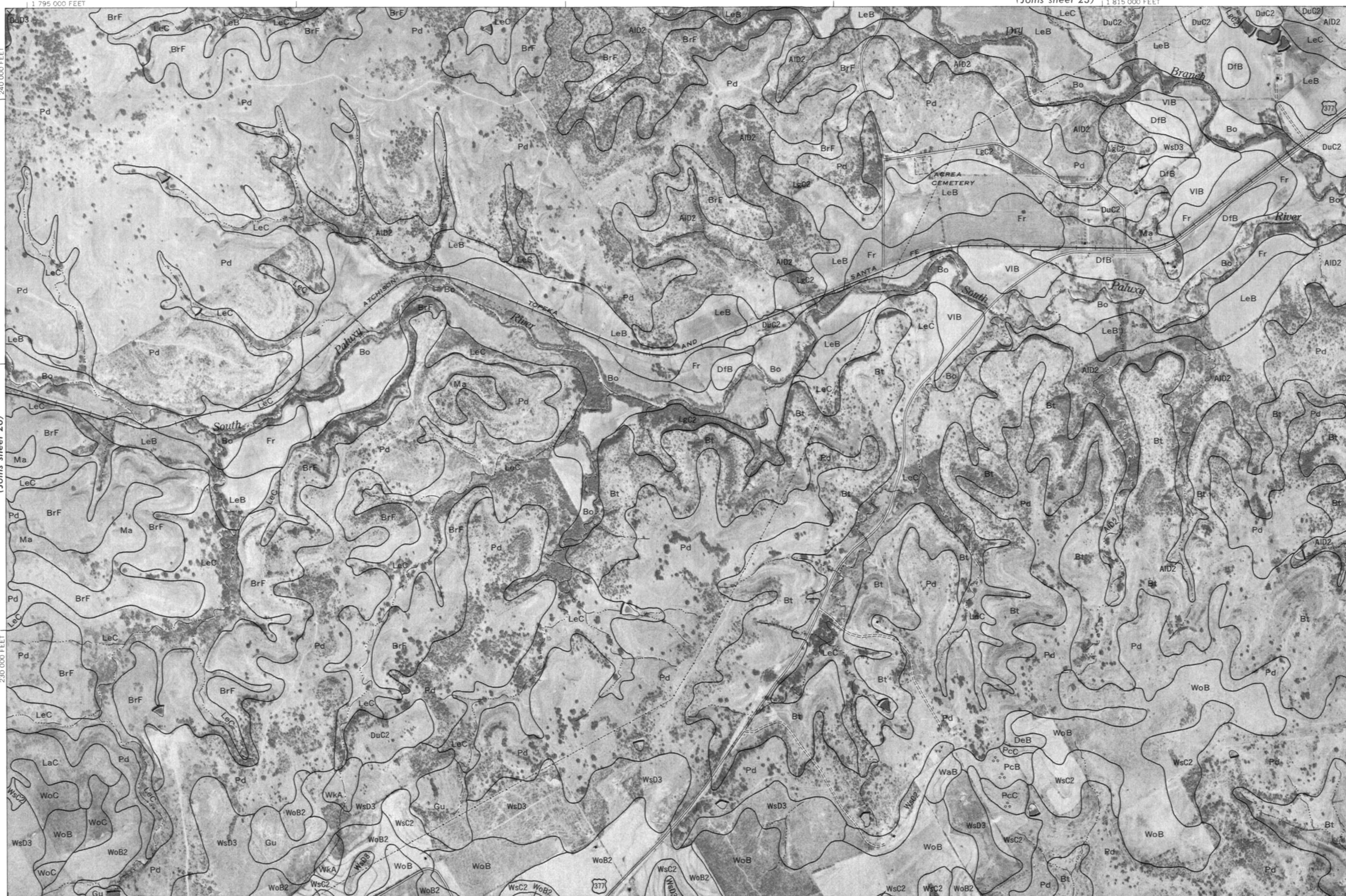
ERATH COUNTY, TEXAS — SHEET NUMBER 29

(29)

(Joins sheet 23)

1 795 000 FEET

1 815 000 FEET



(Joins sheet 37)

ERATH COUNTY, TEXAS NO. 29
(Joins sheet 28)

(Joins sheet 30)

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

N

1 Mile

5000 Feet

Scale 1:20000

ERATH COUNTY, TEXAS — SHEET NUMBER 3

3

ERATH COUNTY, TEXAS NO. 3
(Joins sheet 2)

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

N

1 Mile
5000 Feet
Scale 1:20000

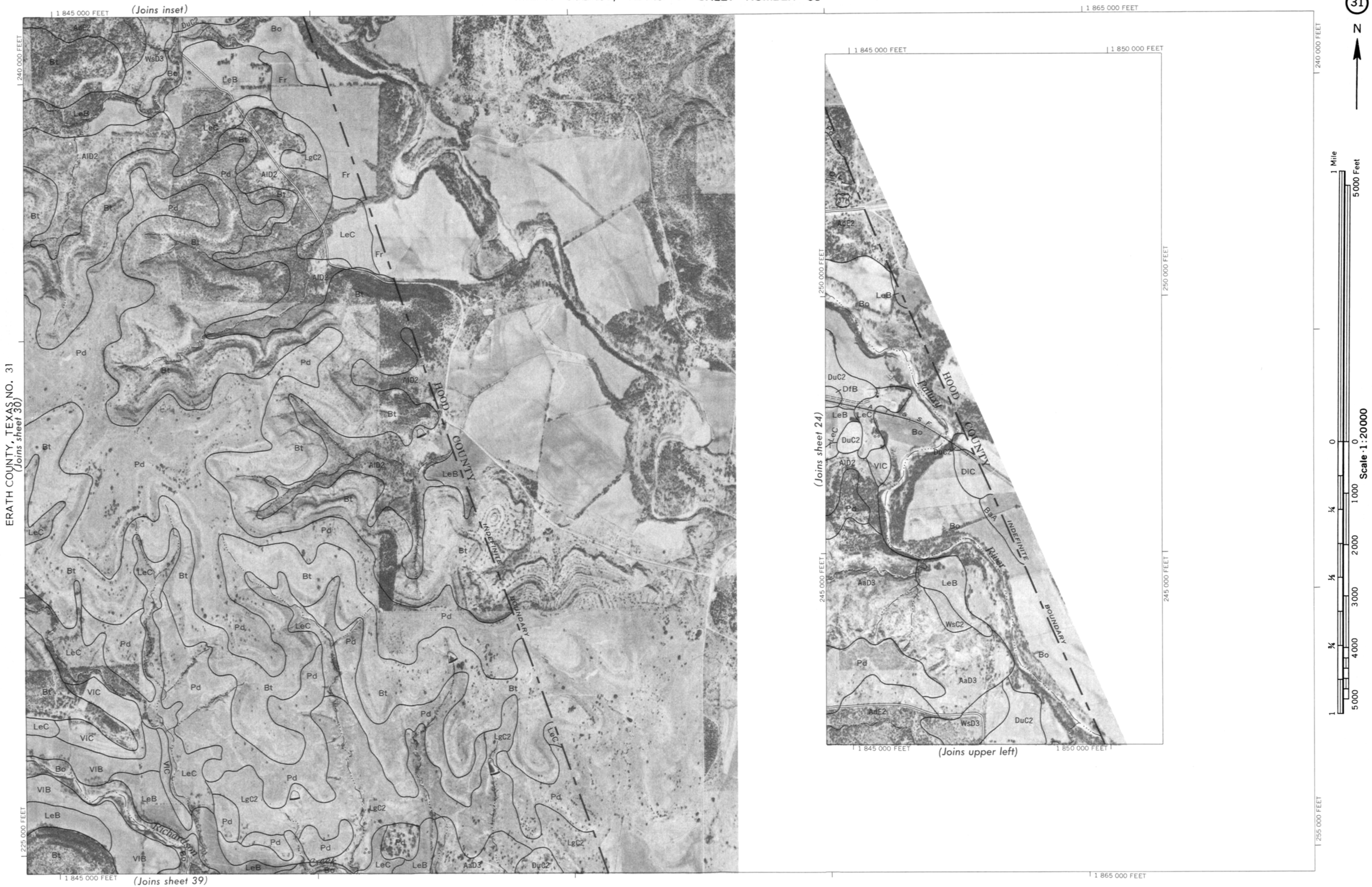
ERATH COUNTY, TEXAS — SHEET NUMBER 30

ERATH COUNTY, TEXAS NO. 30

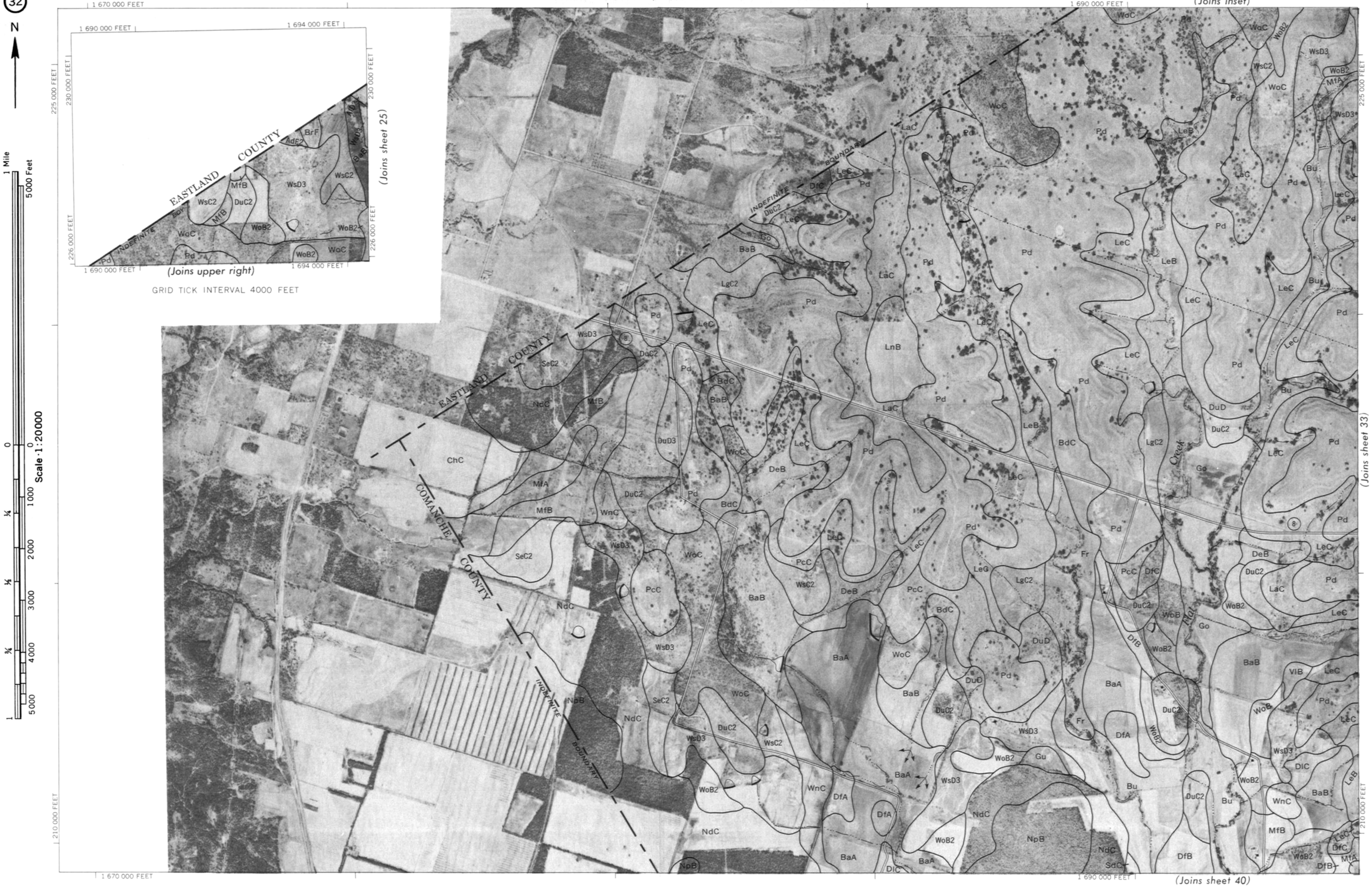
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.



ERATH COUNTY, TEXAS — SHEET NUMBER 32



ERATH COUNTY, TEXAS NO. 32

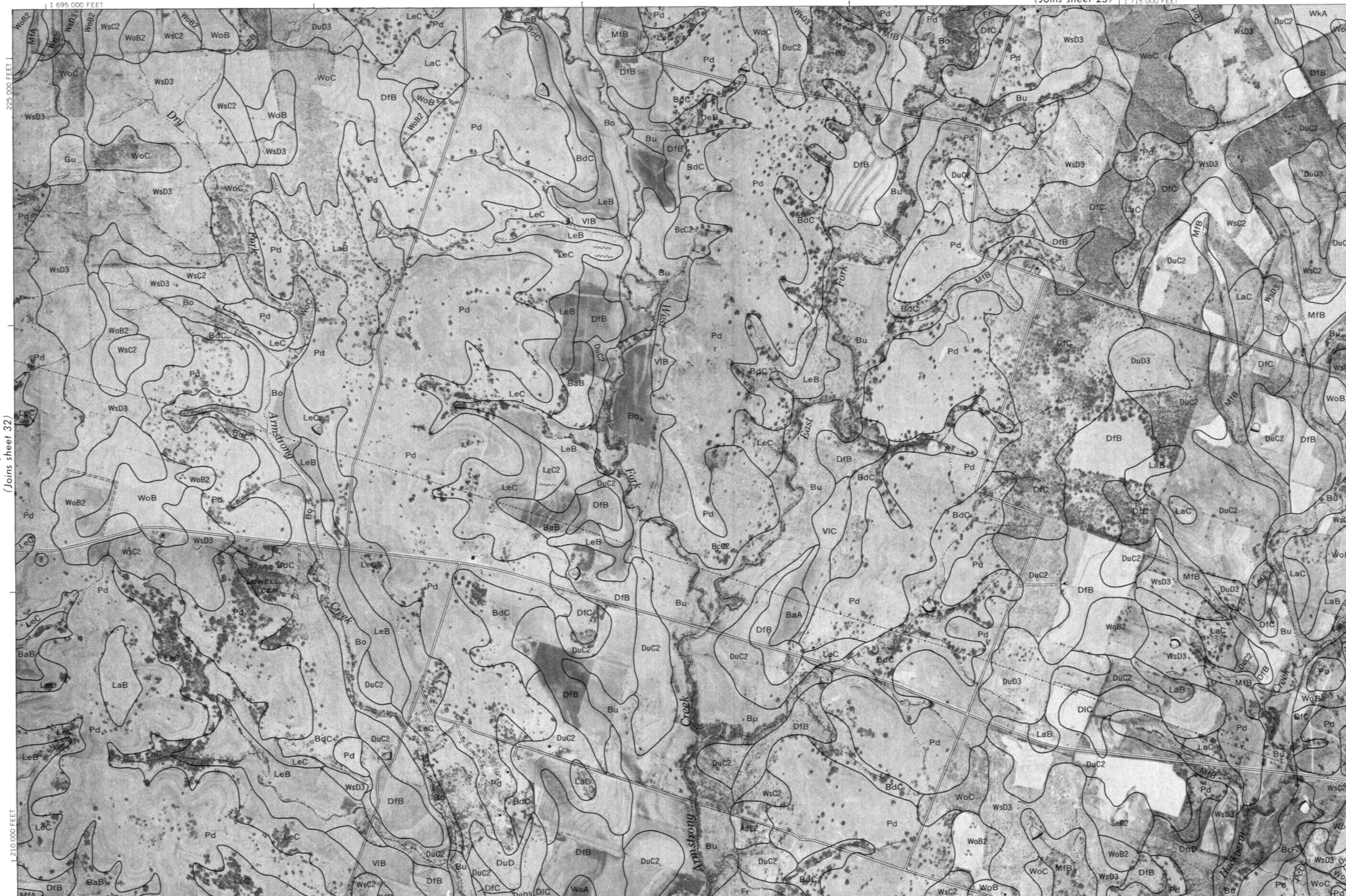
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

33

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS NO. 33
(Joins sheet 32)

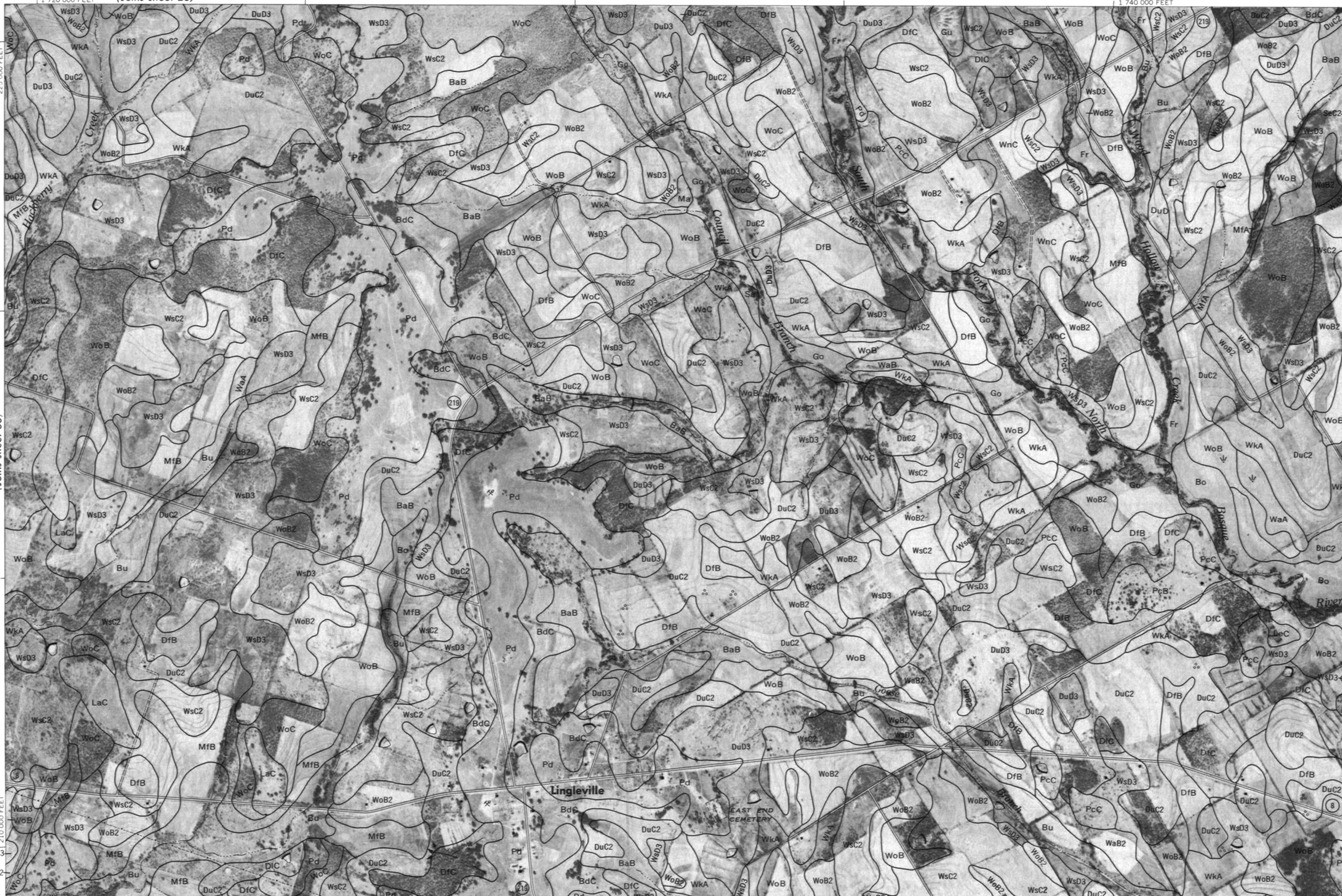


N

1 Mile
5000 Feet
Scale 1:20000

ERATH COUNTY, TEXAS — SHEET NUMBER 34

(Joins sheet 26)



N

Scale 1:20000

1 Mile — 3/4 — 1/2 — 1/4 — 0

5000 Feet — 4000 — 3000 — 2000 — 1000 — 0

(Joins sheet 33)

(Joins sheet 35)

(Joins sheet 42)

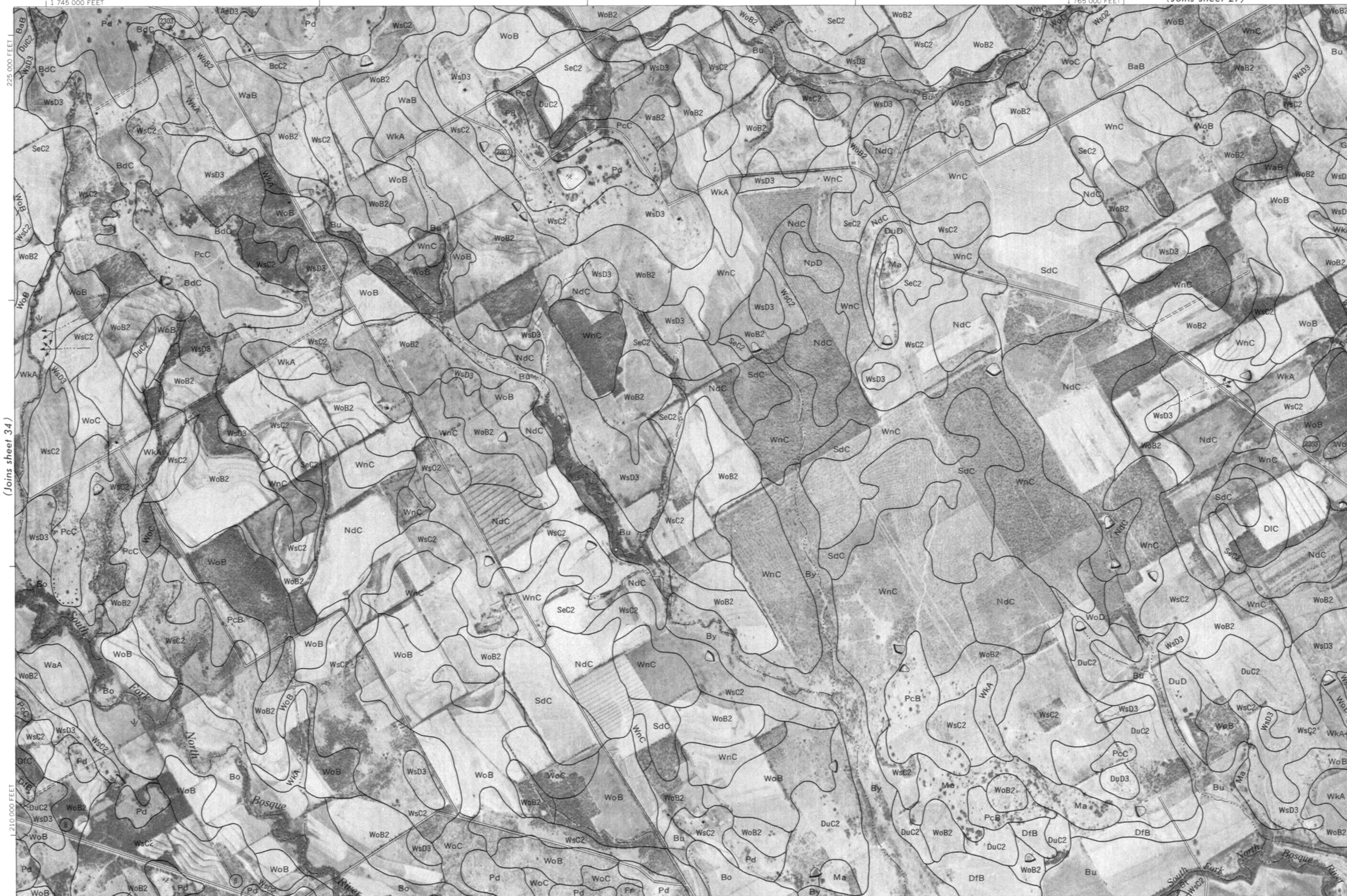
ERATH COUNTY, TEXAS NO. 34

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

35

(Joins sheet 27)



(Joins sheet 34)

(Joins sheet 36)

(Joins sheet 43)

ERATH COUNTY, TEXAS NO. 35

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

N

Scale 1:20000

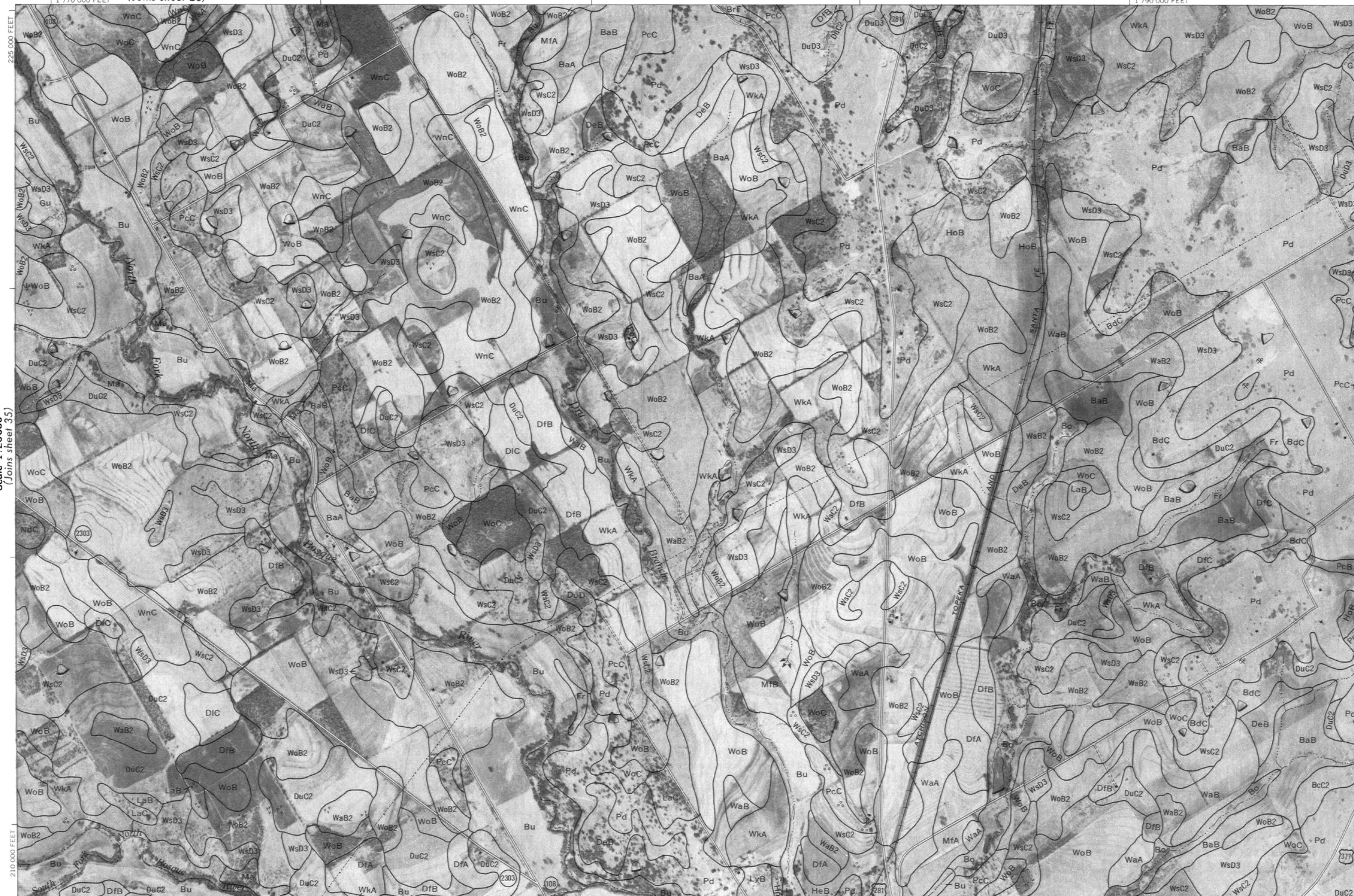
1 Mile — ¾ — ½ — ¼ — 0 — 1

5000 Feet — 4000 — 3000 — 2000 — 1000 — 0 — 5000

ERATH COUNTY, TEXAS — SHEET NUMBER 36

36

N



1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000
¼
½
¾
1

ERATH COUNTY, TEXAS NO. 36

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

(Joins sheet 29)

(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 45)

ERATH COUNTY, TEXAS NO. 37

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

N

1 Mile

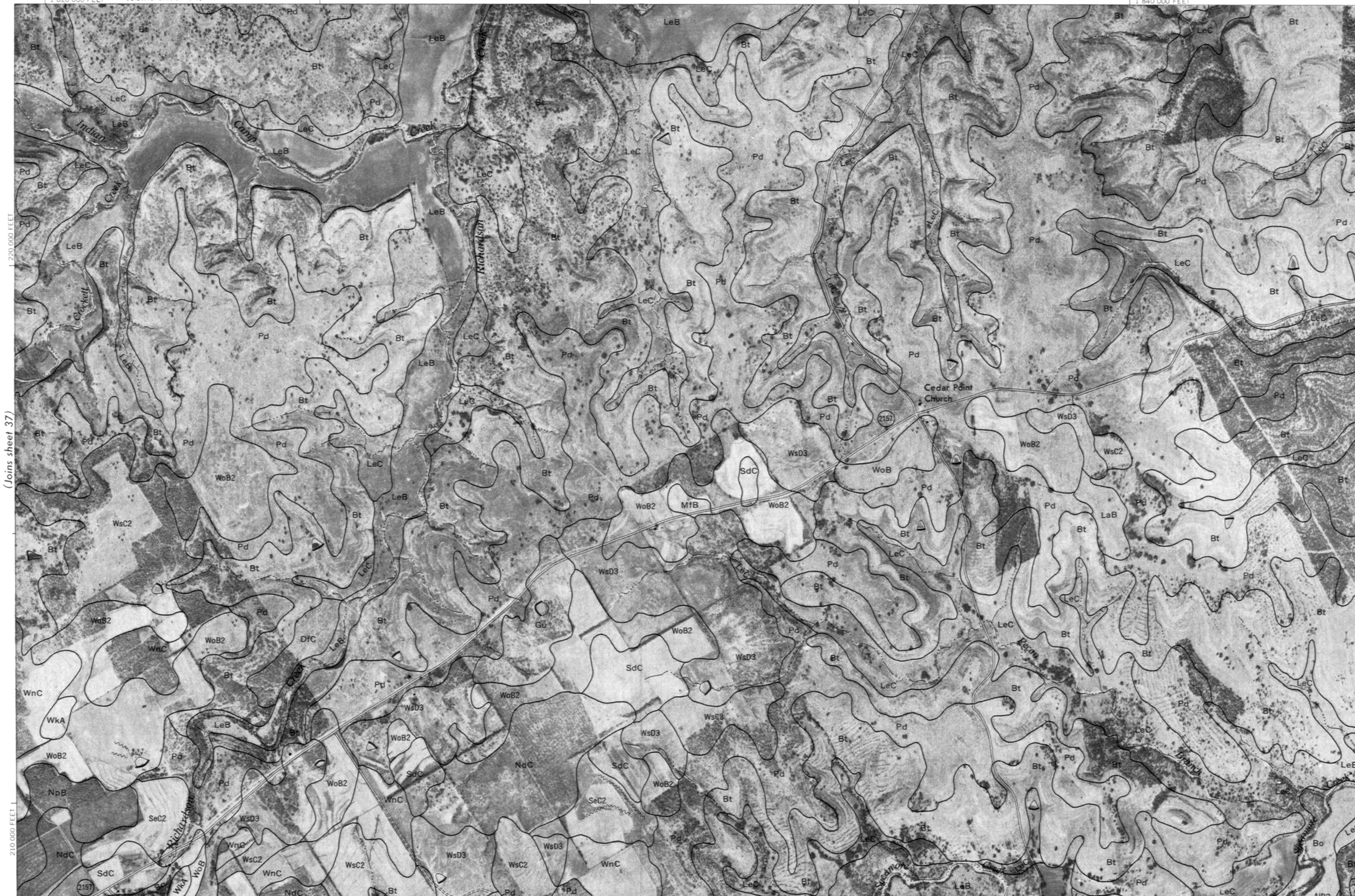
5000 Feet

Scale 1:20000

ERATH COUNTY, TEXAS — SHEET NUMBER 38

N

(Joins sheet 30)



1 Mile
5000 Feet
0
Scale 1:20000
0 1000 2000 3000 4000 5000

ERATH COUNTY, TEXAS NO. 38

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS NO. 39

4

ERATH COUNTY, TEXAS — SHEET NUMBER 4

N

1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
¼
½
¾
1
Scale 1:20000

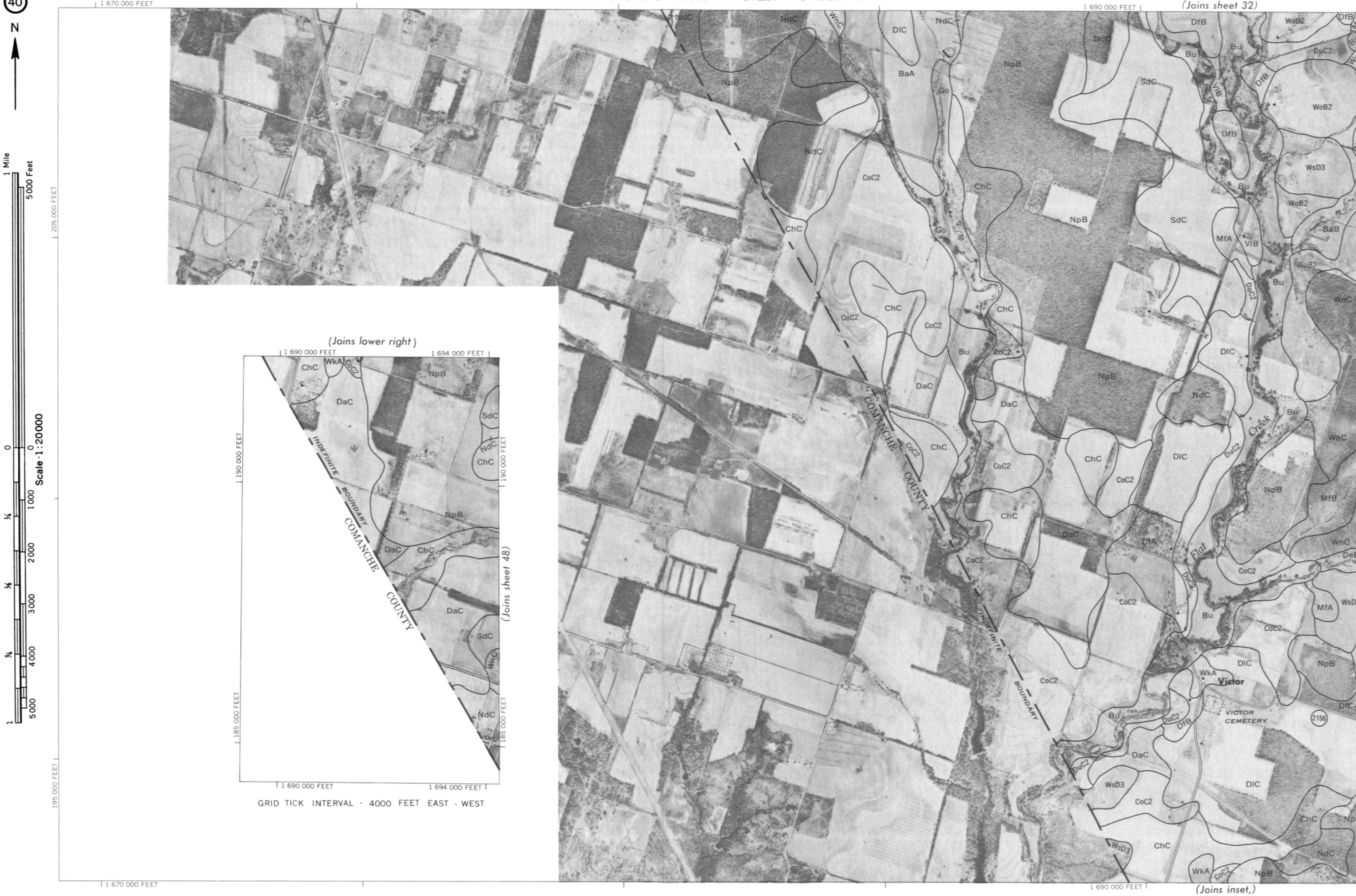
ERATH COUNTY, TEXAS NO. 4

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

40

ERATH COUNTY, TEXAS — SHEET NUMBER 40



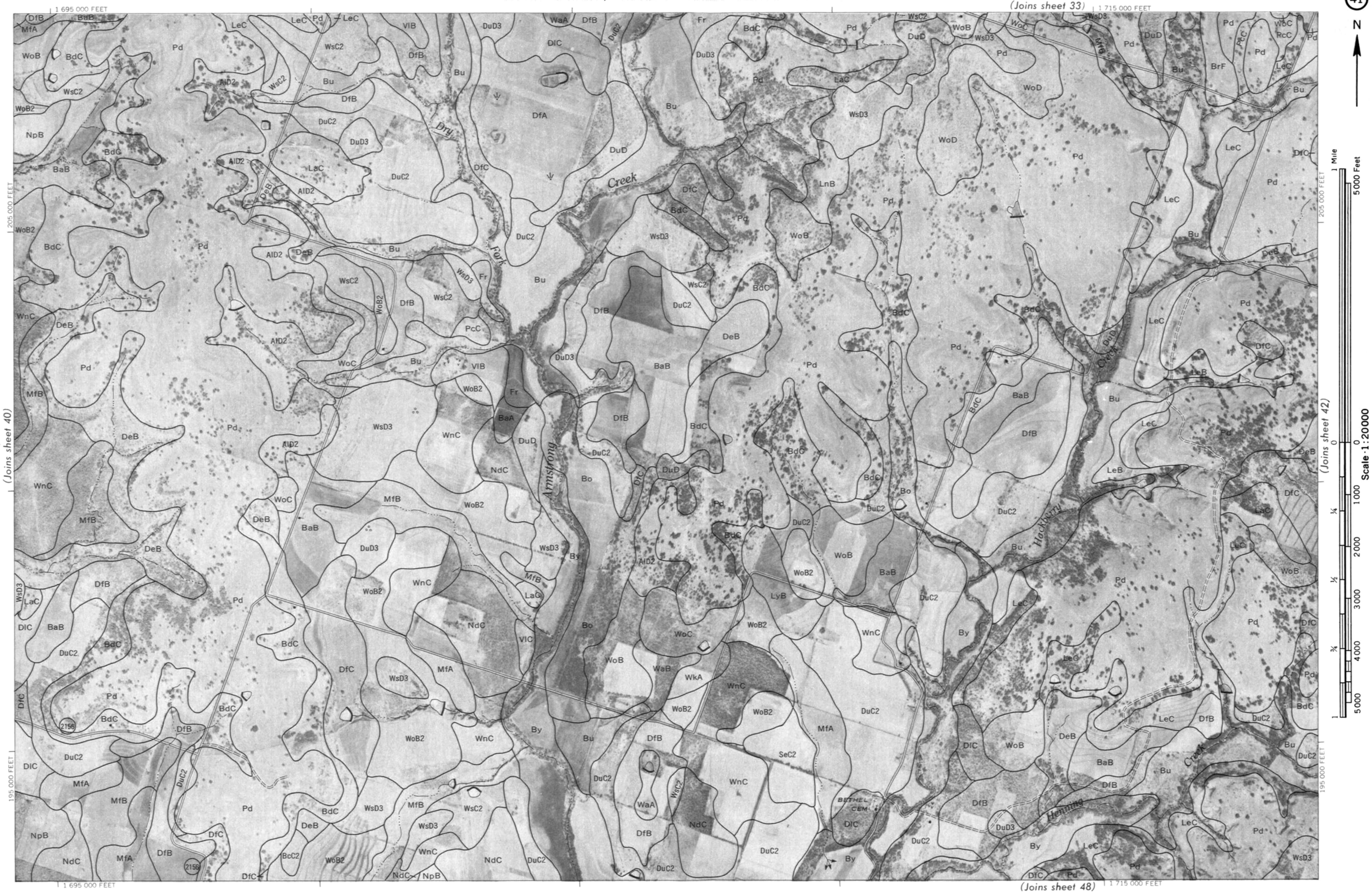
ERATH COUNTY, TEXAS NO. 40

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 41

41



ERATH COUNTY, TEXAS NO. 41

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

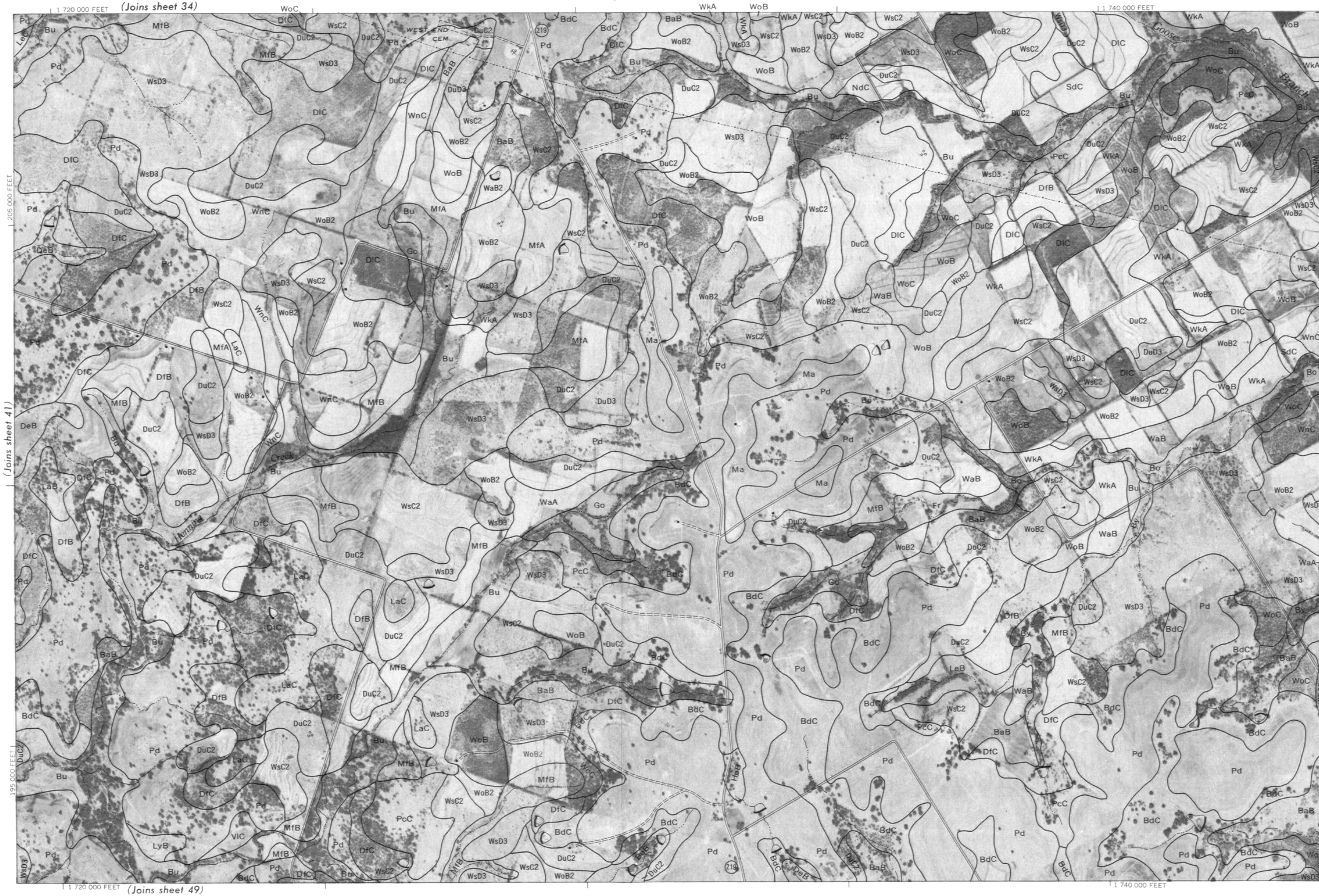
42

ERATH COUNTY, TEXAS — SHEET NUMBER 42

N

1 Mile
5 000 Feet

Scale 1:20 000



ERATH COUNTY, TEXAS NO. 42

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

43

N

1 Mile

5000 Feet

0

¼

½

¾

1

0

1000

2000

3000

4000

5000

Scale 1:20000

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 44

N

1 770 000 FEET (Joins sheet 36)

(Joins sheet 43)

Scale 1:20000

1 Mile ¾ ½ ¼ 0

5000 Feet 4000 3000 2000 1000 0 5000

(Joins sheet 45)

1 770 000 FEET (Joins sheet 51) 1 790 000 FEET

ERATH COUNTY, TEXAS NO. 44

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

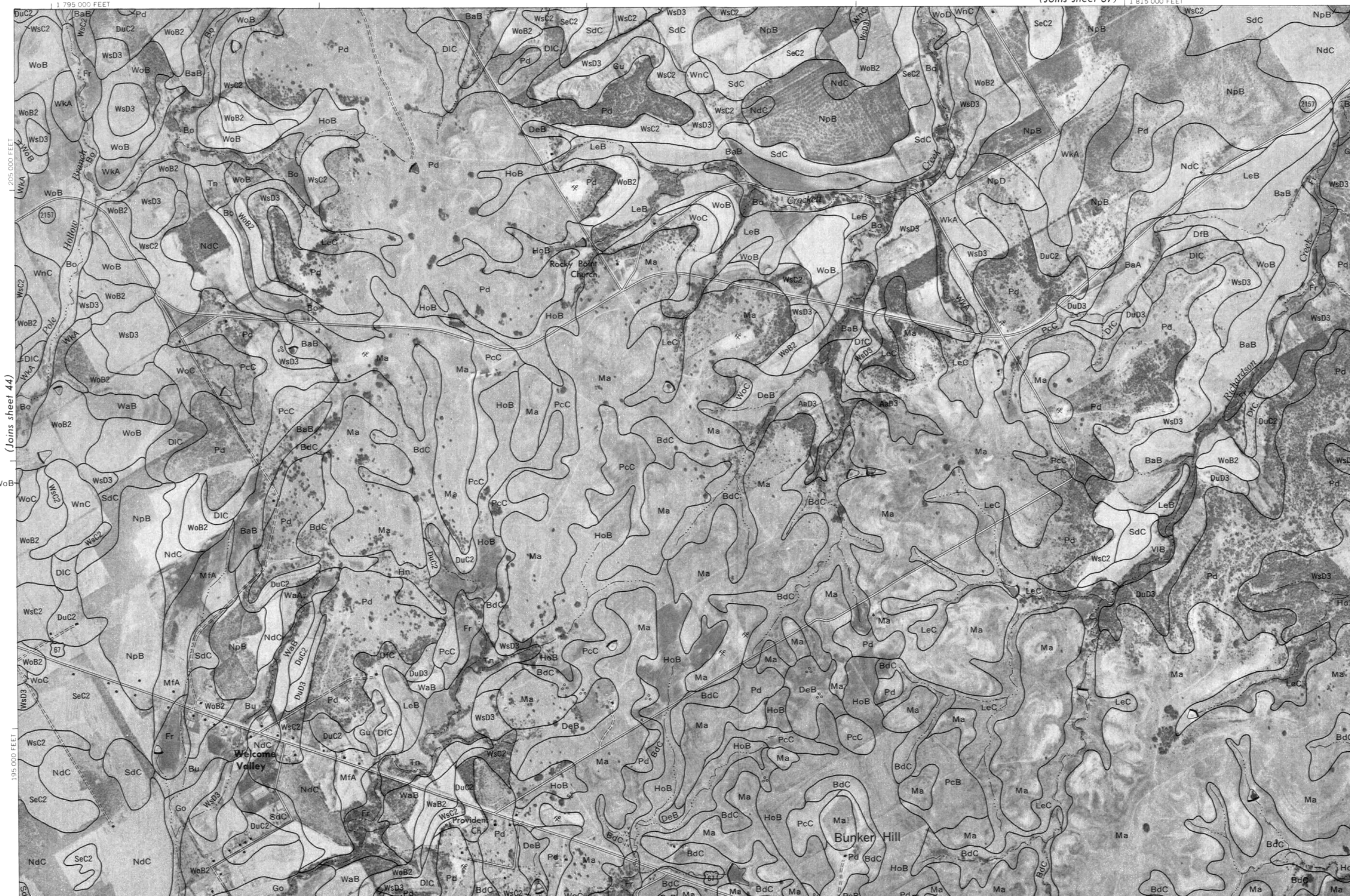
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 45

45

N

(Joins sheet 37)



(Joins sheet 52)

(Joins sheet 44)

(Joins sheet 46)

1 Mile

5000 Feet

Scale 1:20000

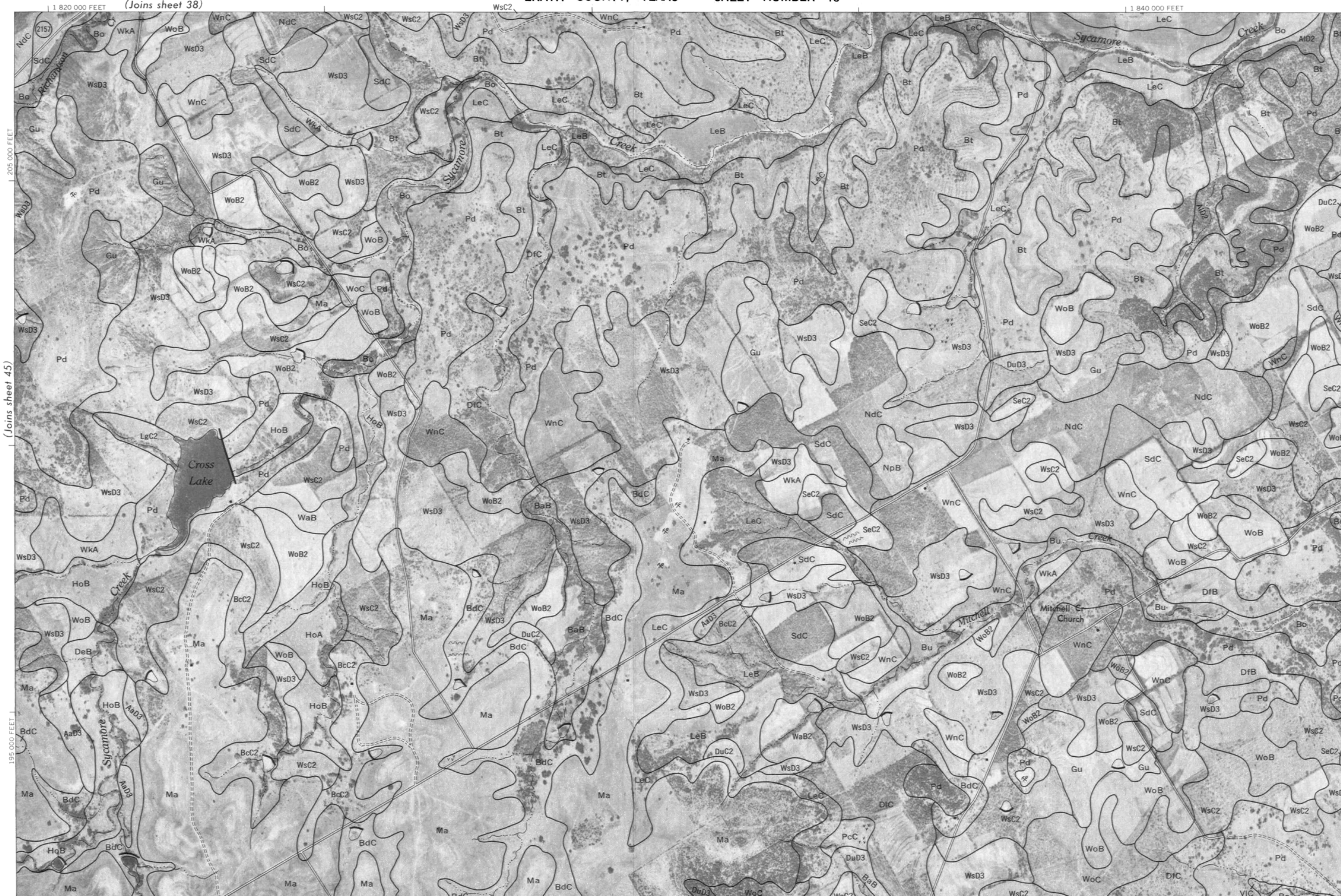
ERATH COUNTY, TEXAS NO. 45

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 46

(Joins sheet 38)



(Joins sheet 45)

(Joins sheet 47)

(Joins sheet 53)

N

1 Mile

5000 Feet

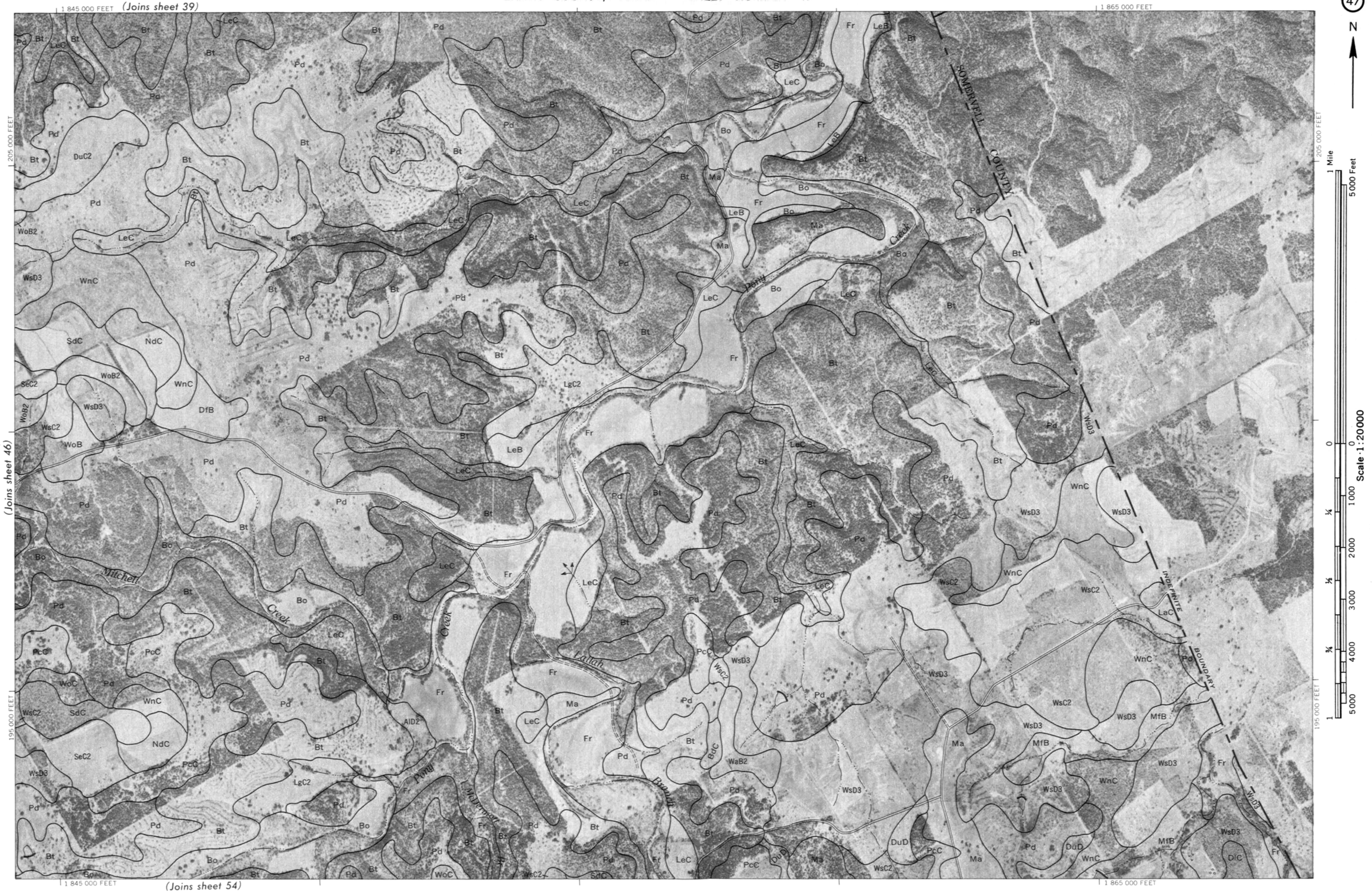
Scale 1:20000

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

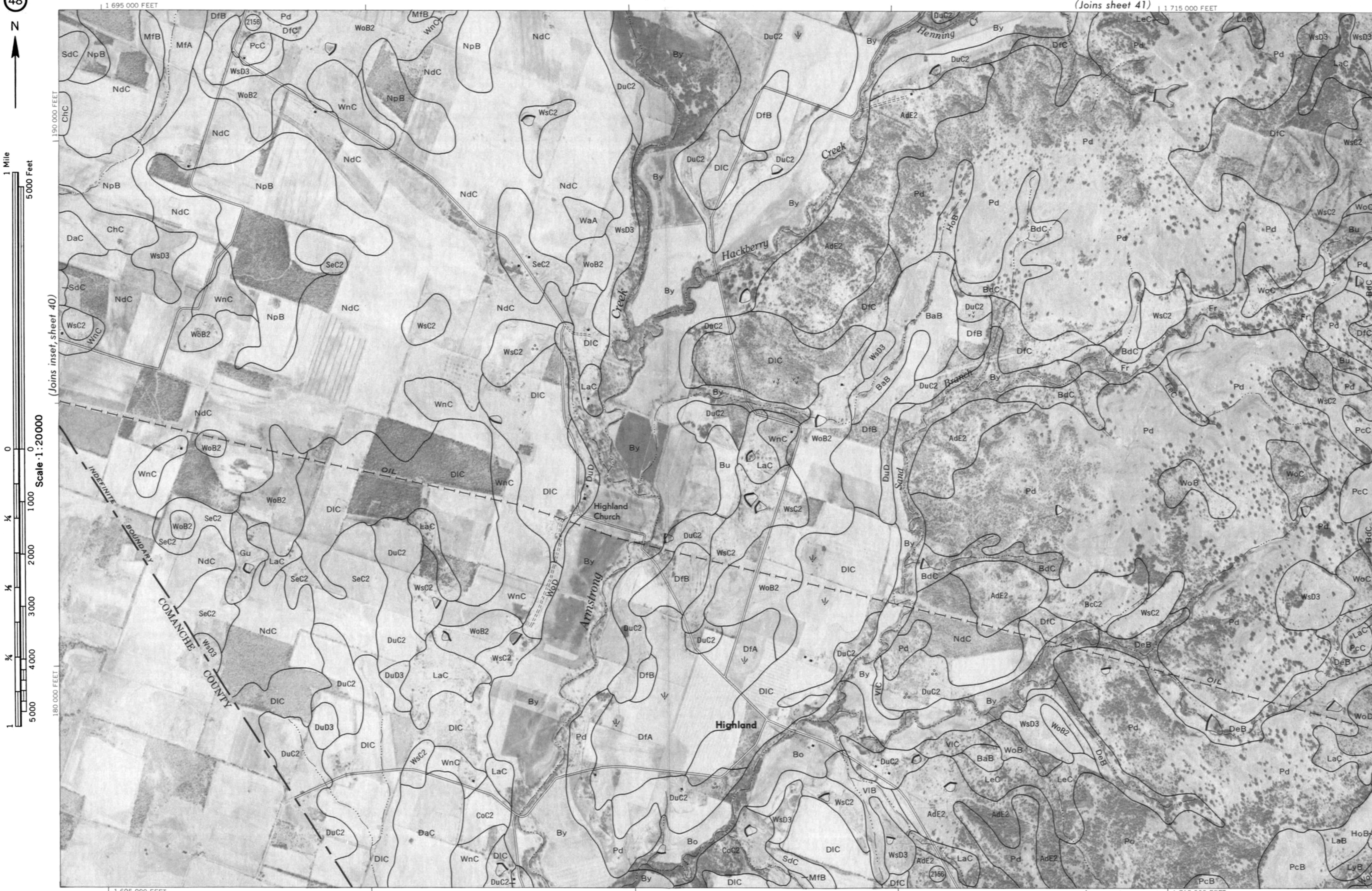
ERATH COUNTY, TEXAS NO. 46

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.



This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 48



ERATH COUNTY, TEXAS NO. 48

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

N

(Joins sheet 42)

(Joins sheet 56)

ERATH COUNTY, TEXAS NO. 49
(Joins sheet 48)

(Joins sheet 50)

Scale 1:20000

1 Mile | ¾ | ½ | ¼ | 0
5000 Feet | 4000 | 3000 | 2000 | 1000 | 0

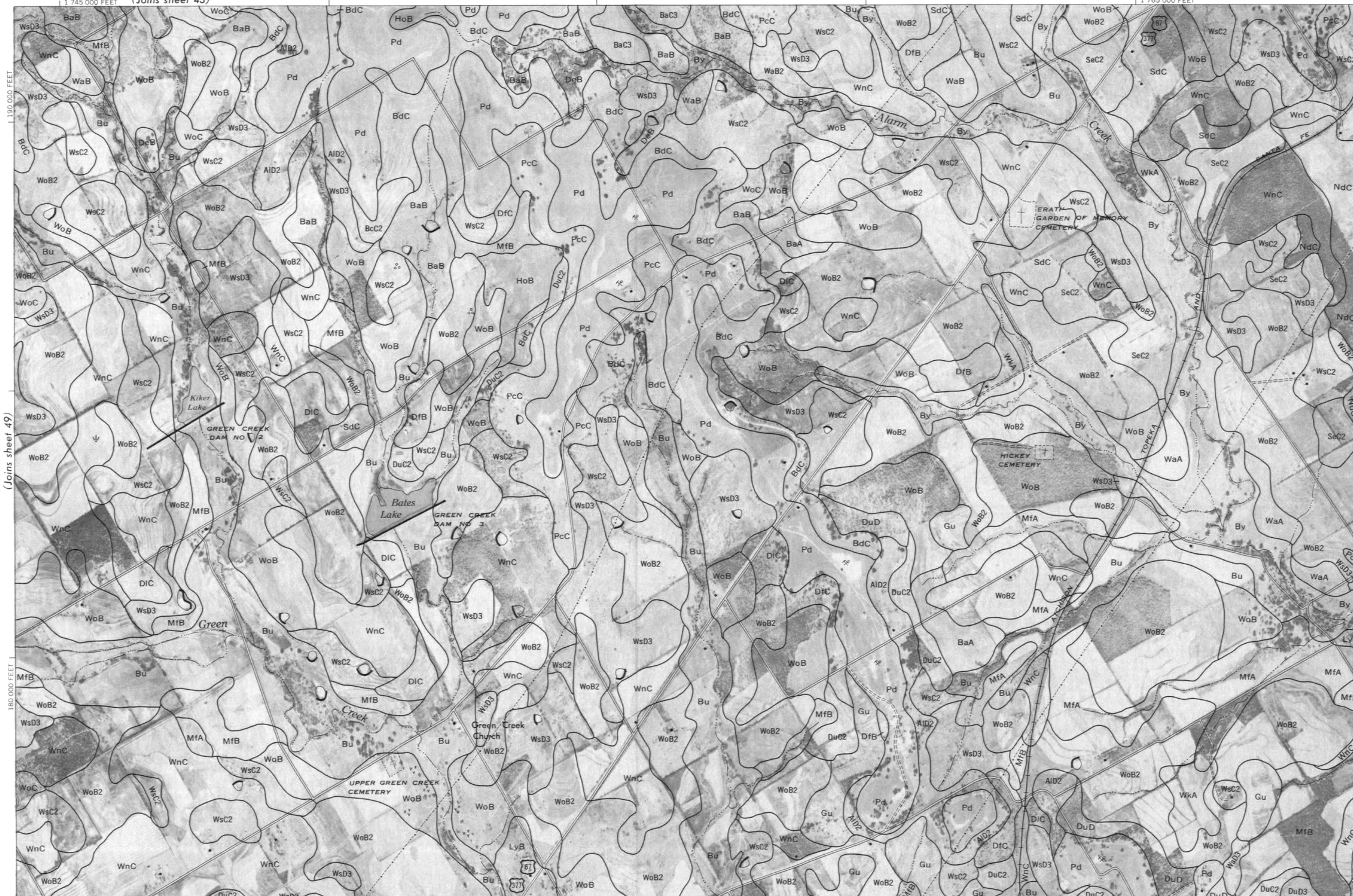
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 5

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 50

(Joins sheet 43)



(Joins sheet 57)

(Joins sheet 49)

(Joins sheet 51)

N

Scale 1:20000

1 Mile — 5000 Feet

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

ERATH COUNTY, TEXAS NO. 50

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

51

N

ERATH COUNTY, TEXAS NO. 51

1 Mile

5000 Feet

Scale 1:20000

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 52

N

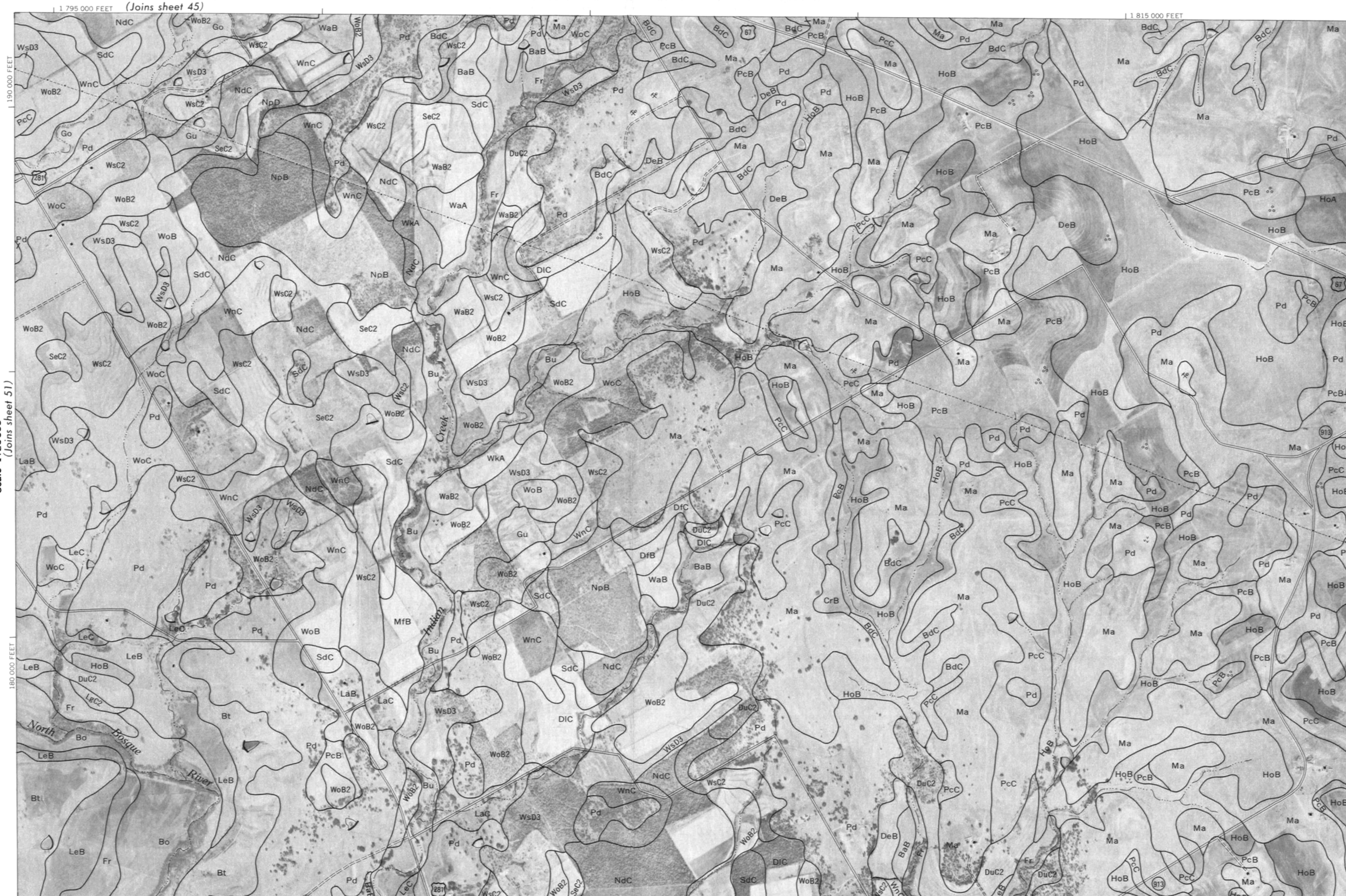
1 Mile

5 000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000



ERATH COUNTY, TEXAS NO. 52

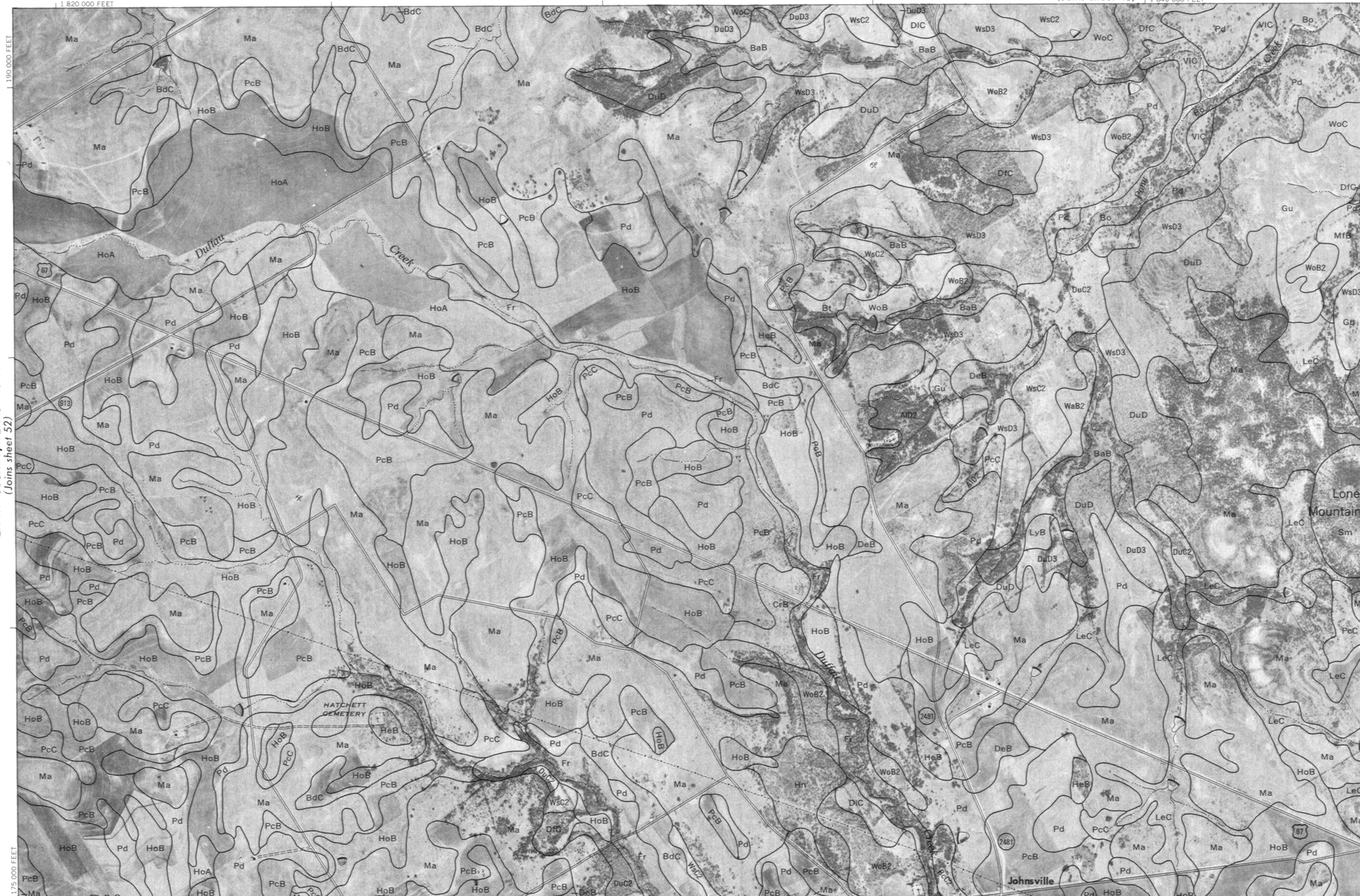
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

(Joins sheet 45)

1 820 000 FEET | 1 840 000 FEET

190 000 FEET



175 000 FEET

1 820 000 FEET | 1 840 000 FEET

(Joins sheet 60)

ERATH COUNTY, TEXAS NO. 53
(Joins sheet 52)

(Joins sheet 54)

N

Scale 1:20000

1 Mile — 1, ¾, ½, ¼, 0

5000 Feet — 5000, 4000, 3000, 2000, 1000, 0

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 54

ERATH COUNTY, TEXAS NO. 54

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 55

55

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS NO. 55

N

1 Mile
5000 Feet
Scale 1:20000
0 1000 2000 3000 4000 5000
0 ¼ ½ ¾ 1

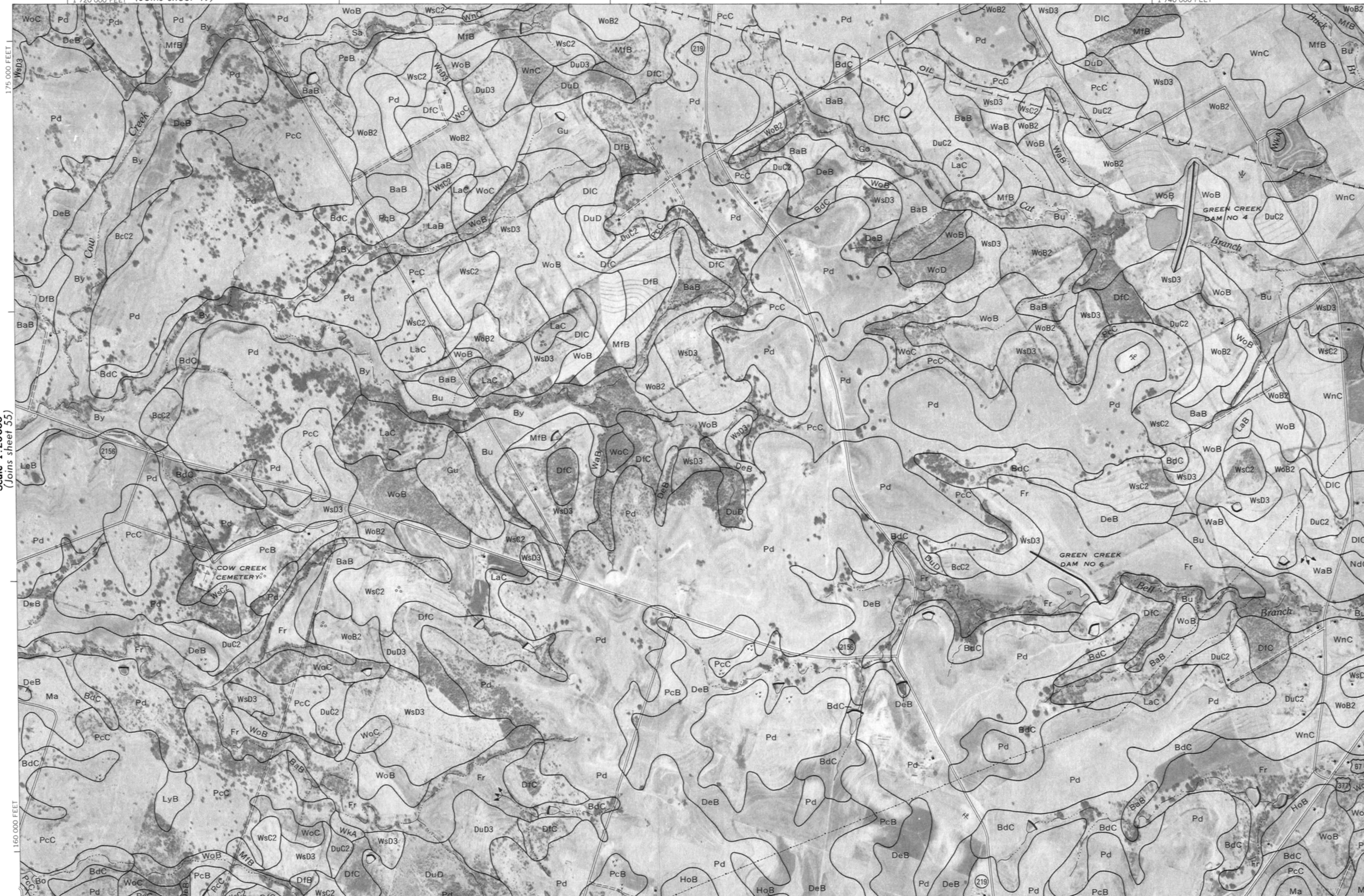
56

ERATH COUNTY, TEXAS — SHEET NUMBER 56

N

(Joins sheet 49)

(Joins sheet 55)



(Joins sheet 57)

(Joins sheet 64)

1 Mile

5000 Feet

Scale 1:20000

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

ERATH COUNTY, TEXAS NO. 56

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 57

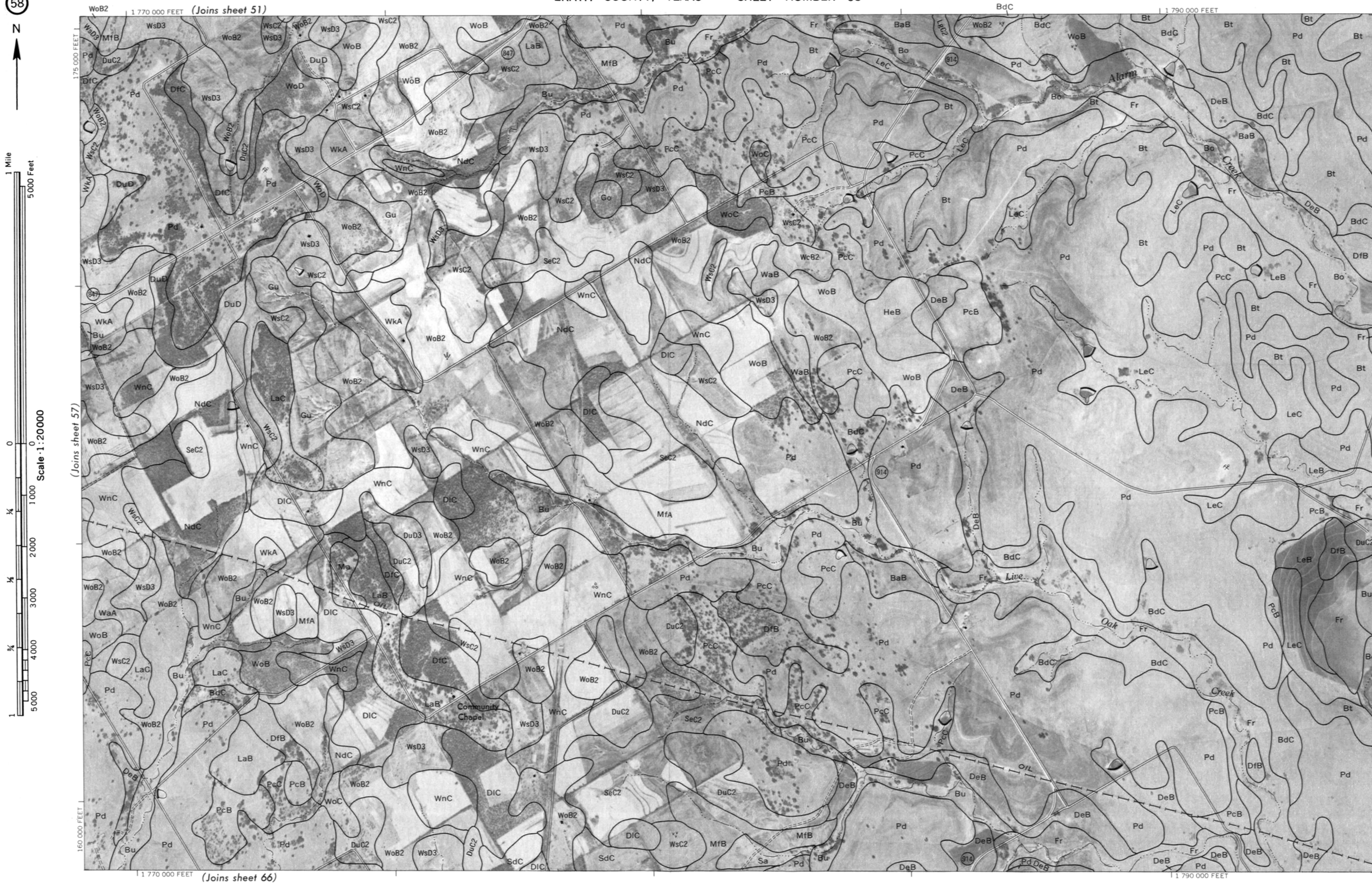
57

N

1 Mile
5000 Feet
Scale 1:20000

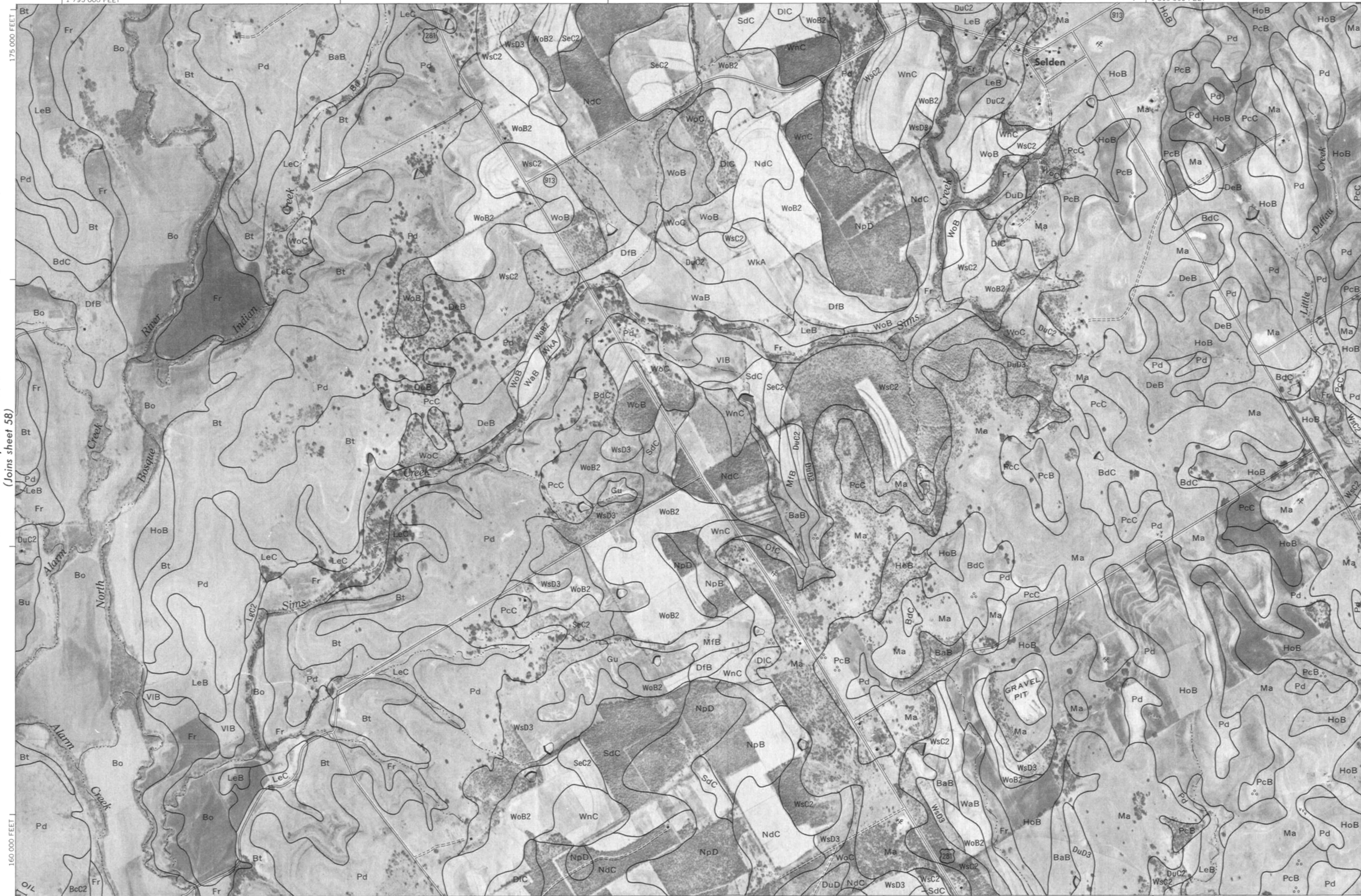
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 58



Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

59



N

Scale 1:20000

1 Mile

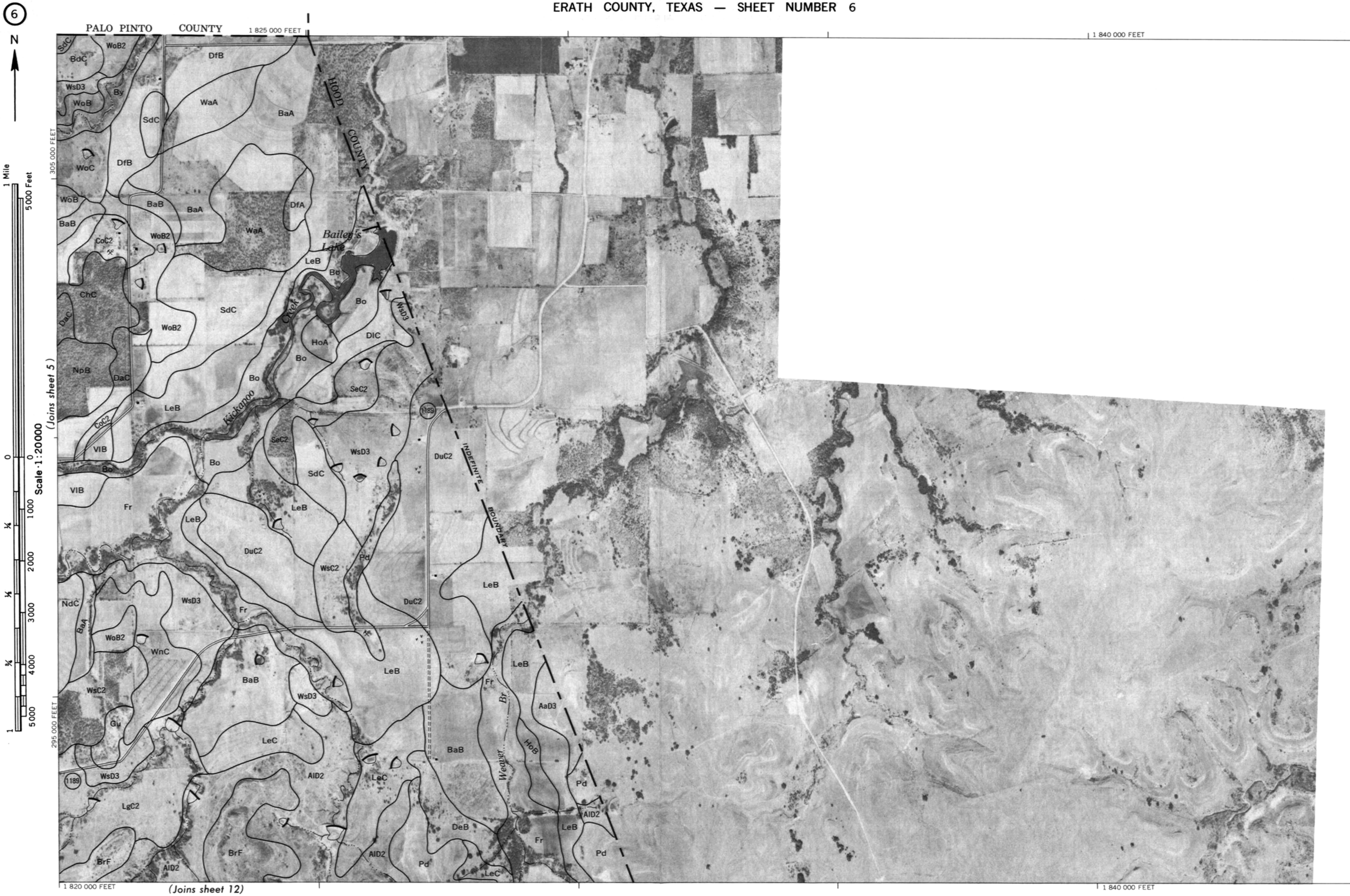
5000 Feet

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 6

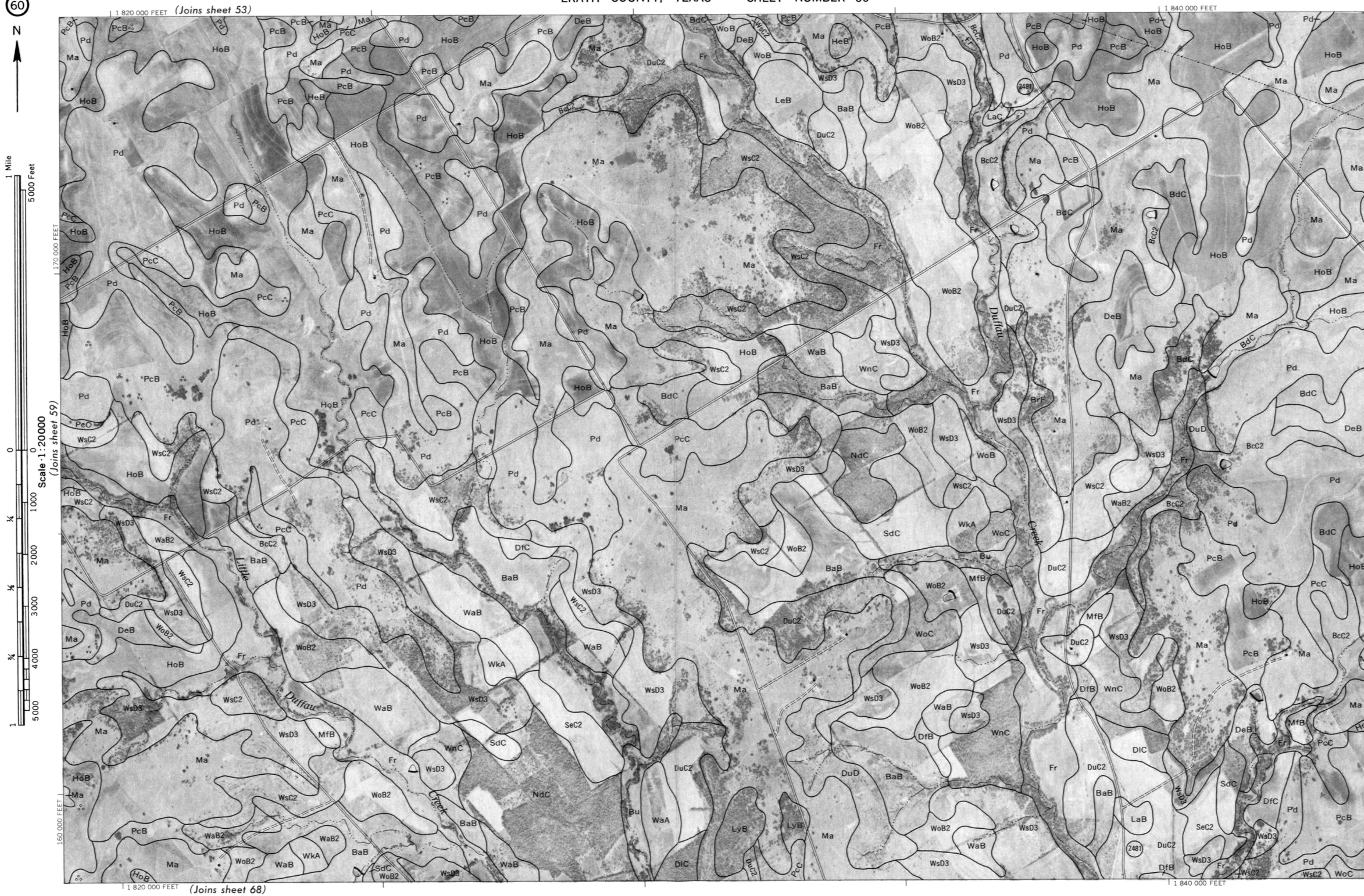


ERATH COUNTY, TEXAS NO. 6

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 60



ERATH COUNTY, TEXAS NO. 60

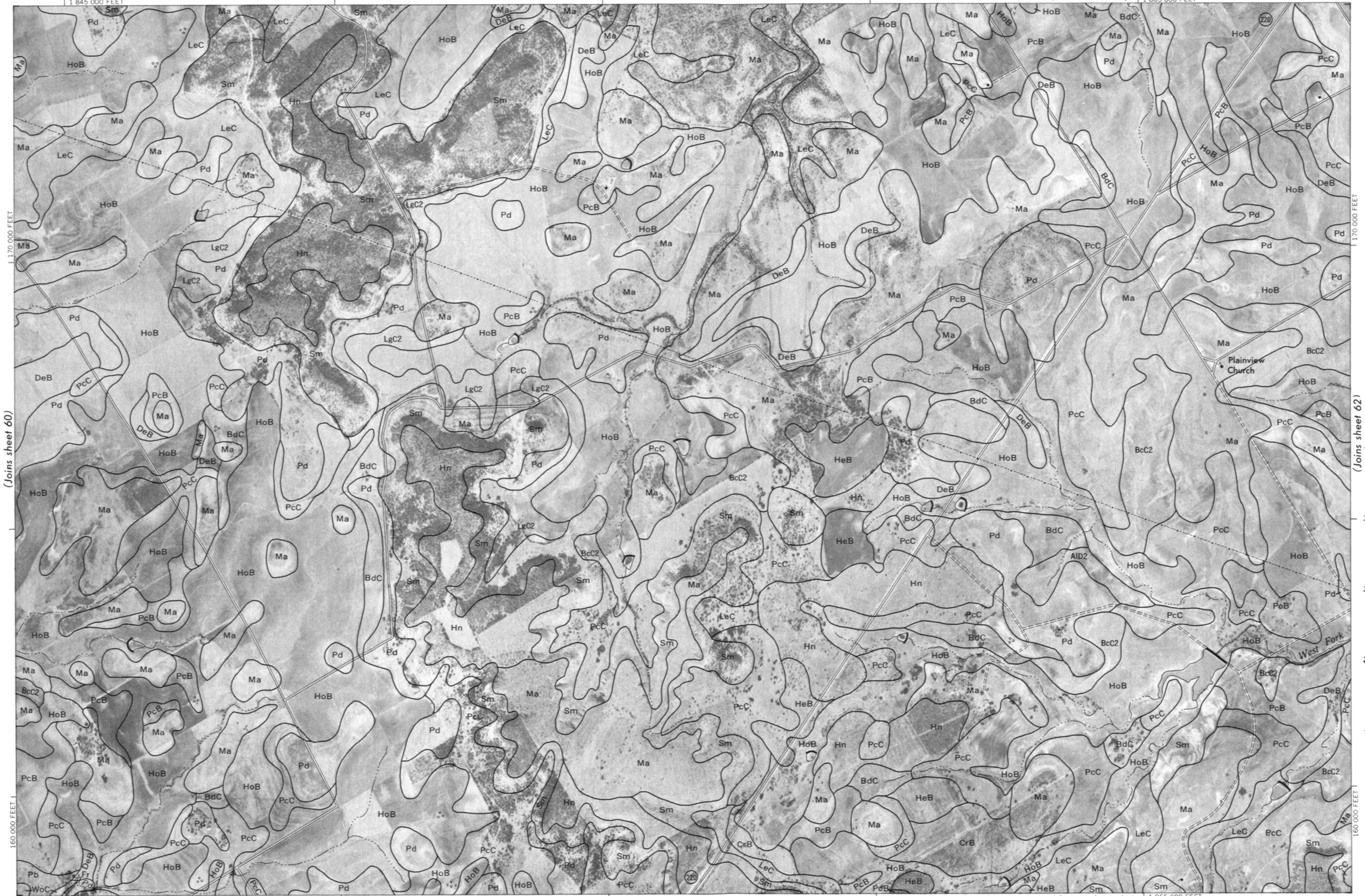
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 61

61

N



ERATH COUNTY, TEXAS NO. 61
(Joins sheet 60)

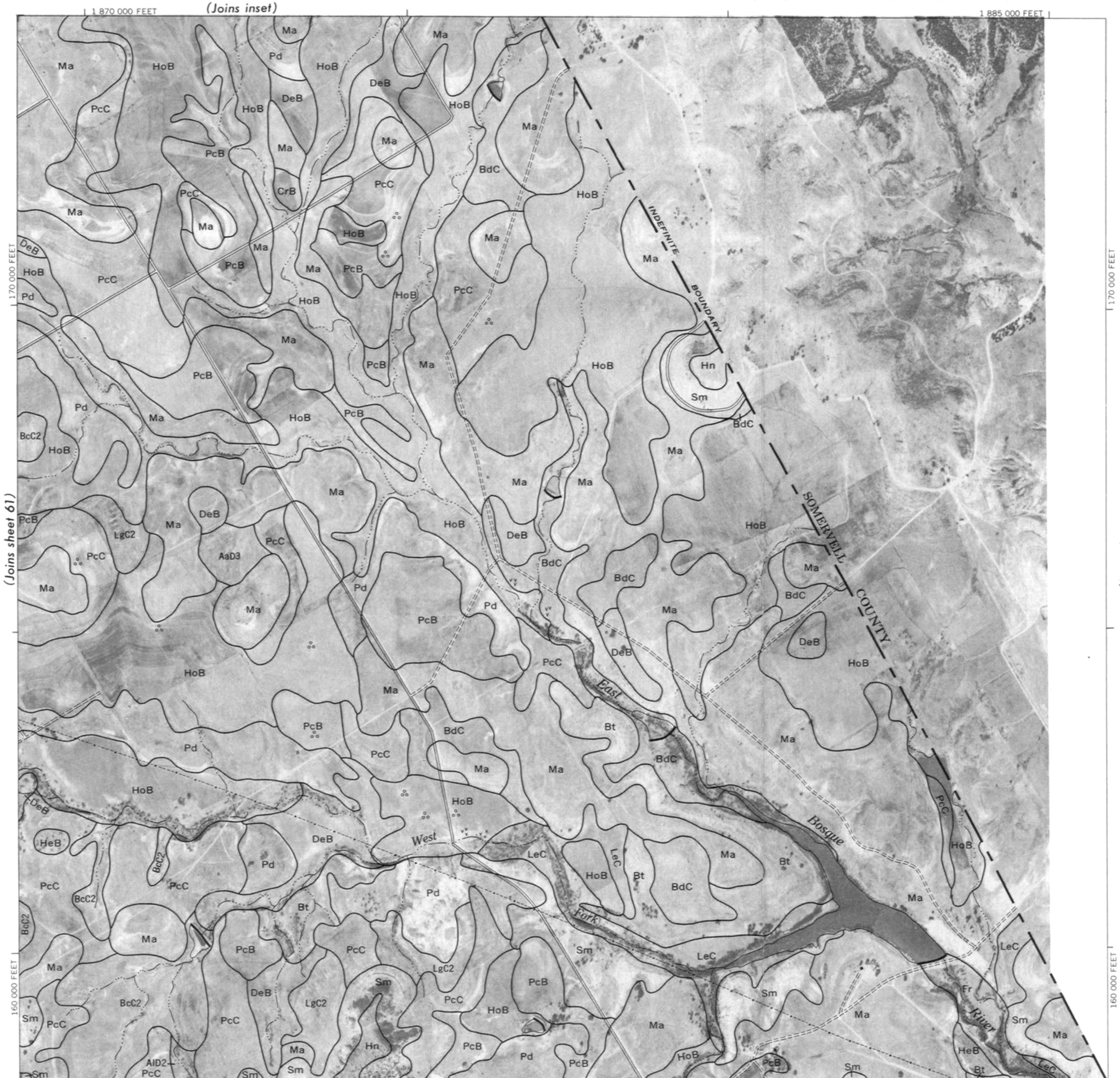
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

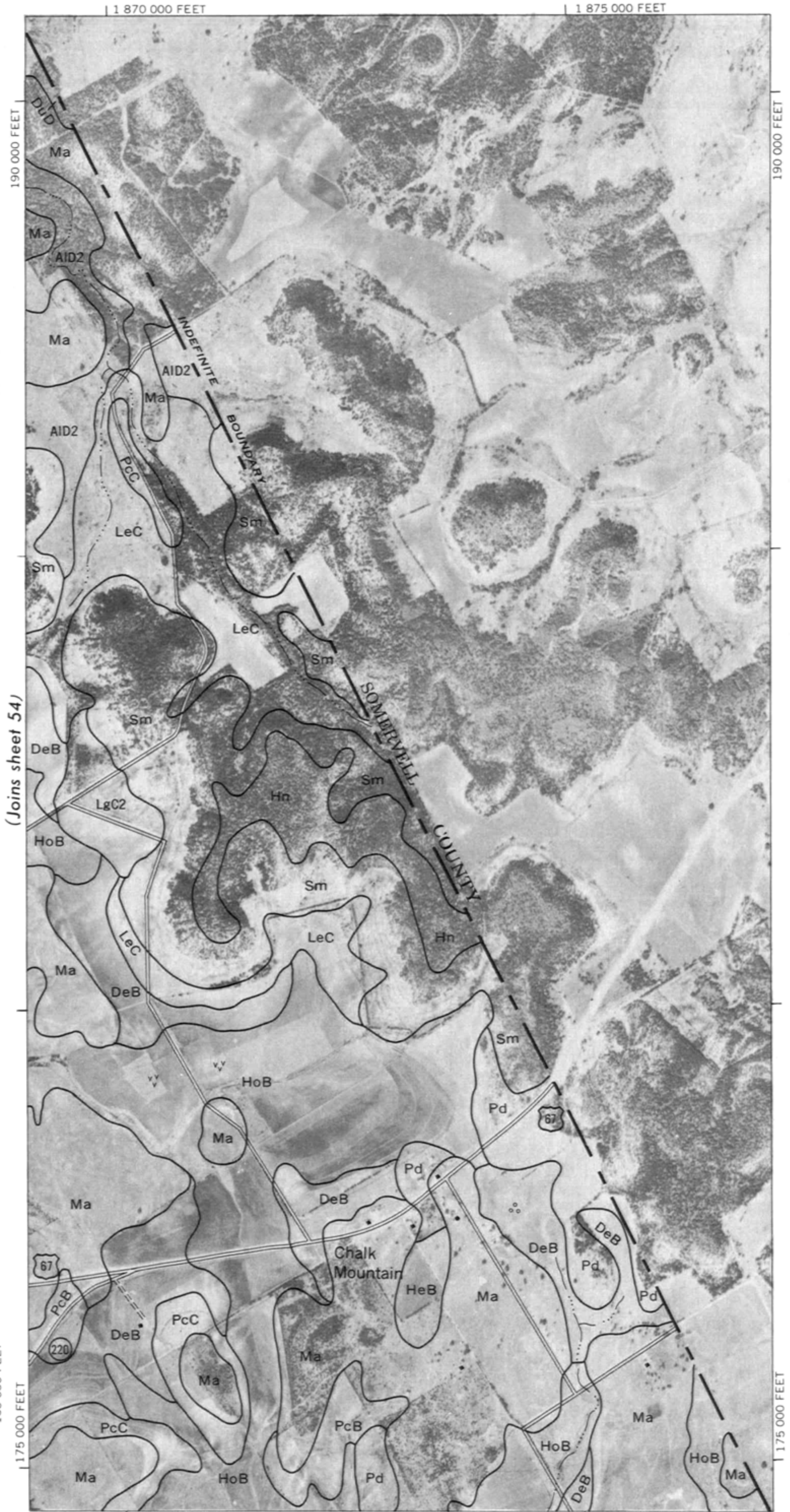
1 Mile
5000 Feet
0
¼
½
¾
1
0
1000
2000
3000
4000
5000
Scale 1:20000

ERATH COUNTY, TEXAS — SHEET NUMBER 62

N

1 Mile
5000 Feet
Scale 1:20000
0
1000
2000
3000
4000
5000

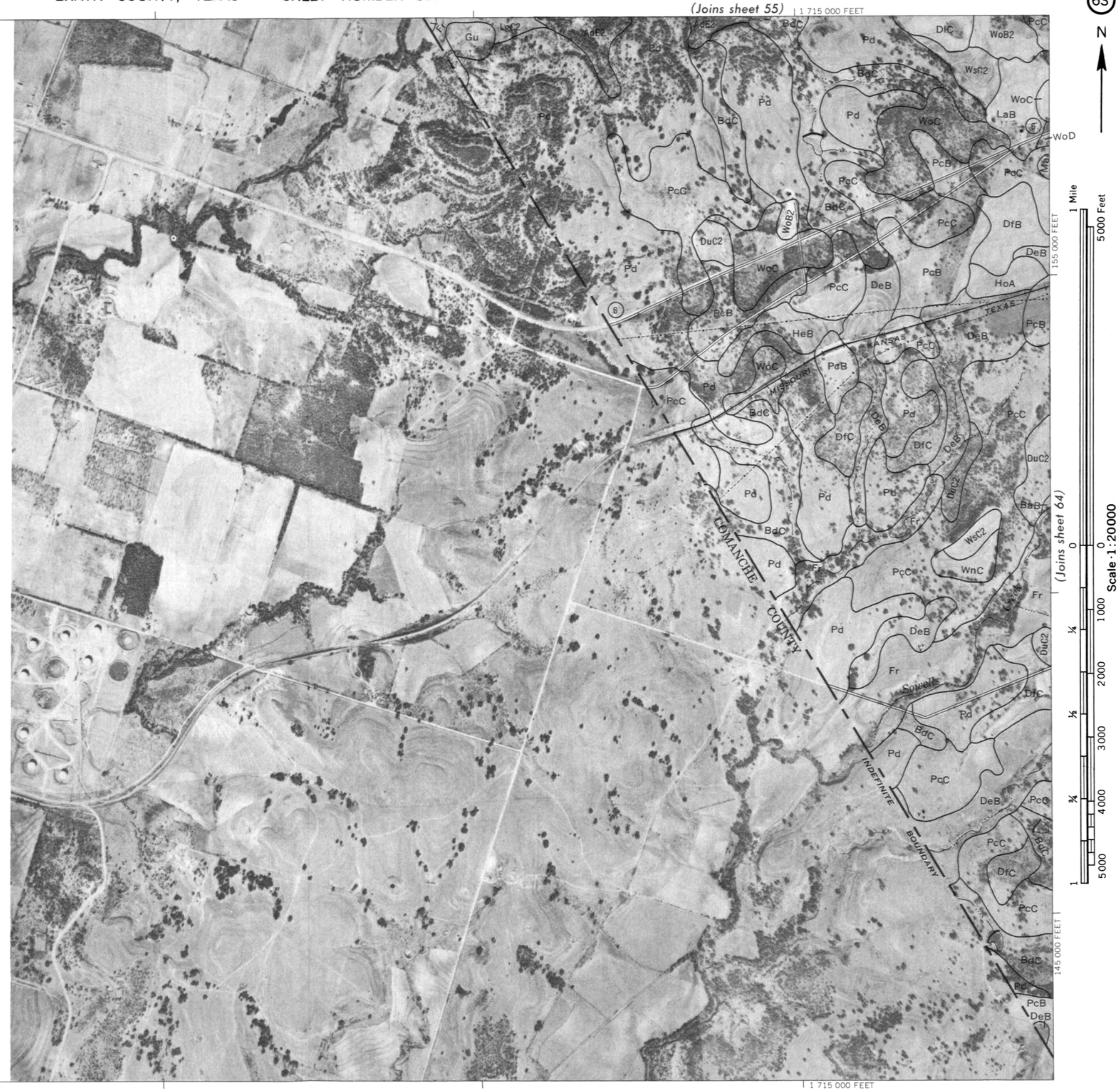




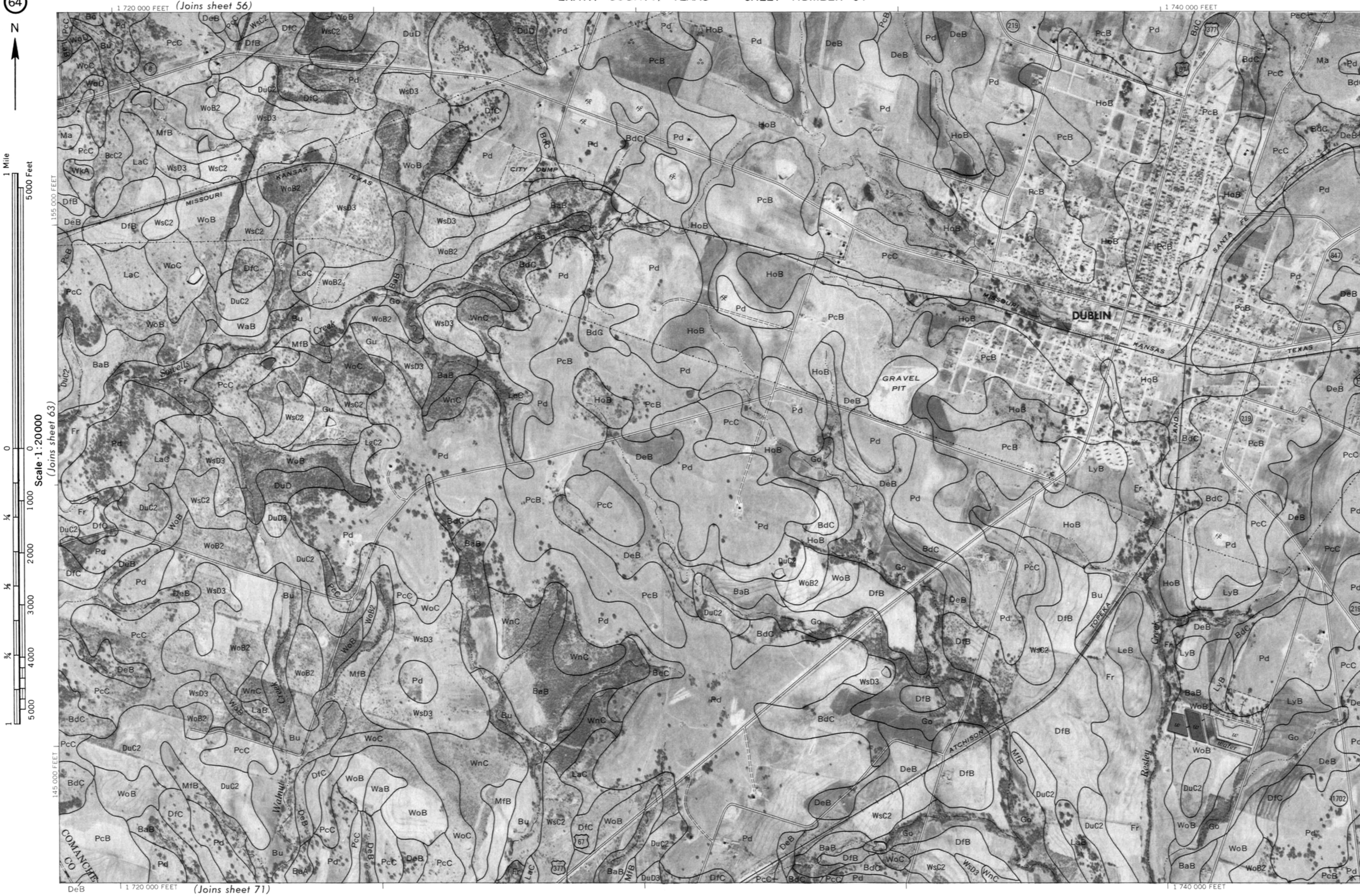
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS NO. 63



ERATH COUNTY, TEXAS — SHEET NUMBER 64



ERATH COUNTY, TEXAS NO. 64

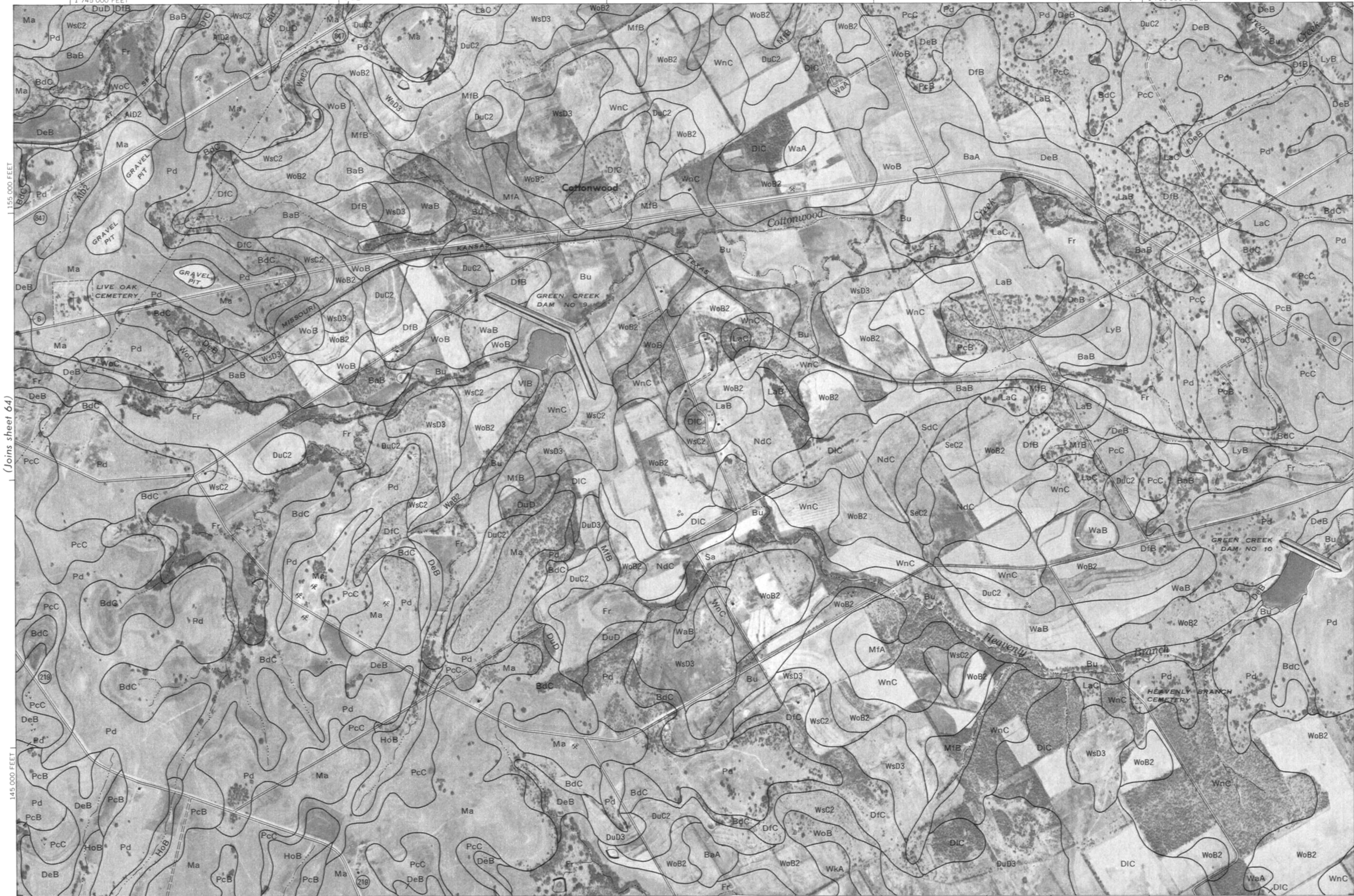
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

1 745 000 FEET

(Joins sheet 57)

1 765 000 FEET

N



155 000 FEET

145 000 FEET

ERATH COUNTY, TEXAS NO. 65

(Joins sheet 64)

(Joins sheet 66)

1 Mile

5000 Feet

Scale 1:20000

(Joins sheet 72)

1 745 000 FEET

1 765 000 FEET

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

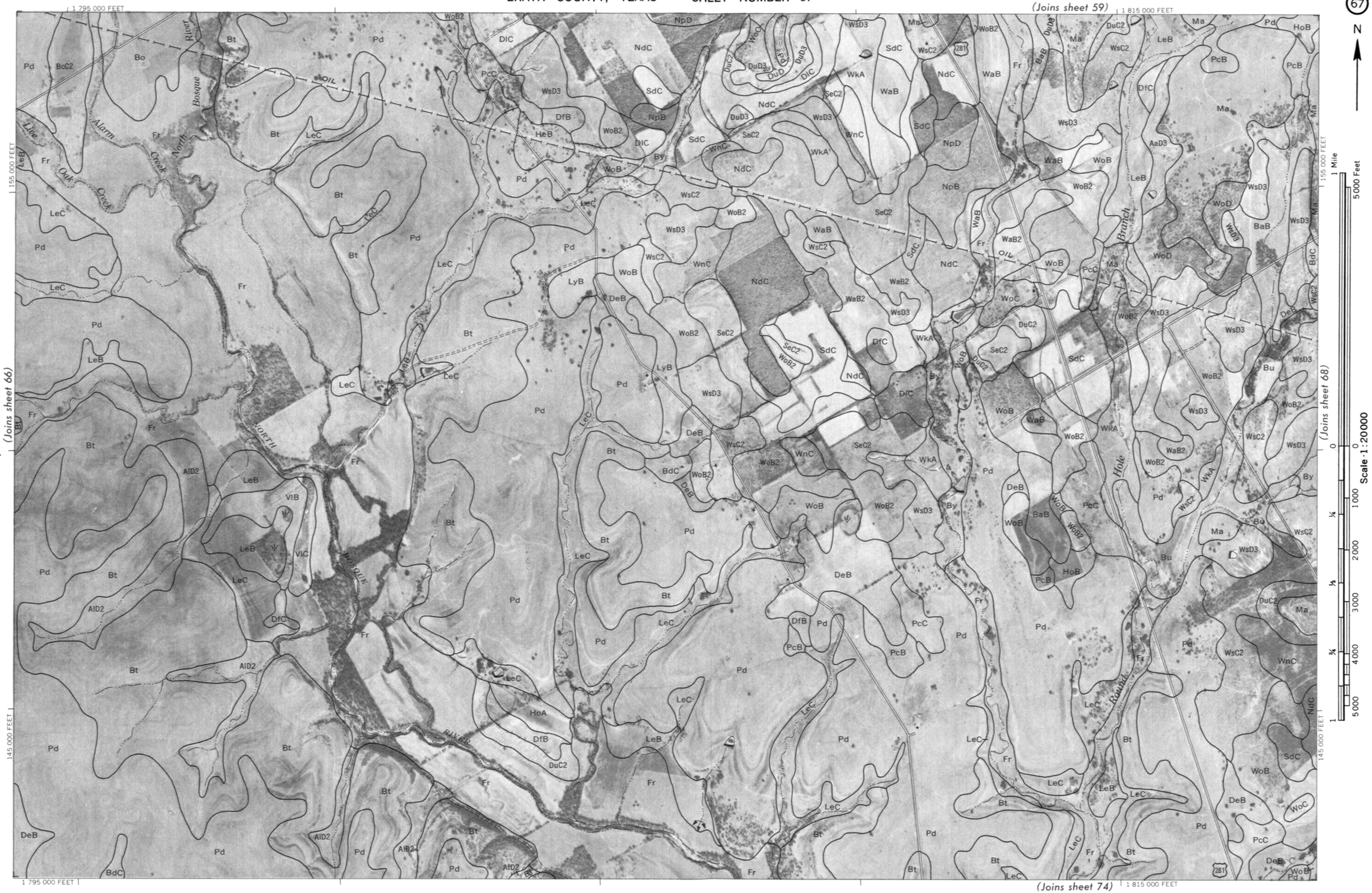
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 66

ERATH COUNTY, TEXAS NO. 66

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

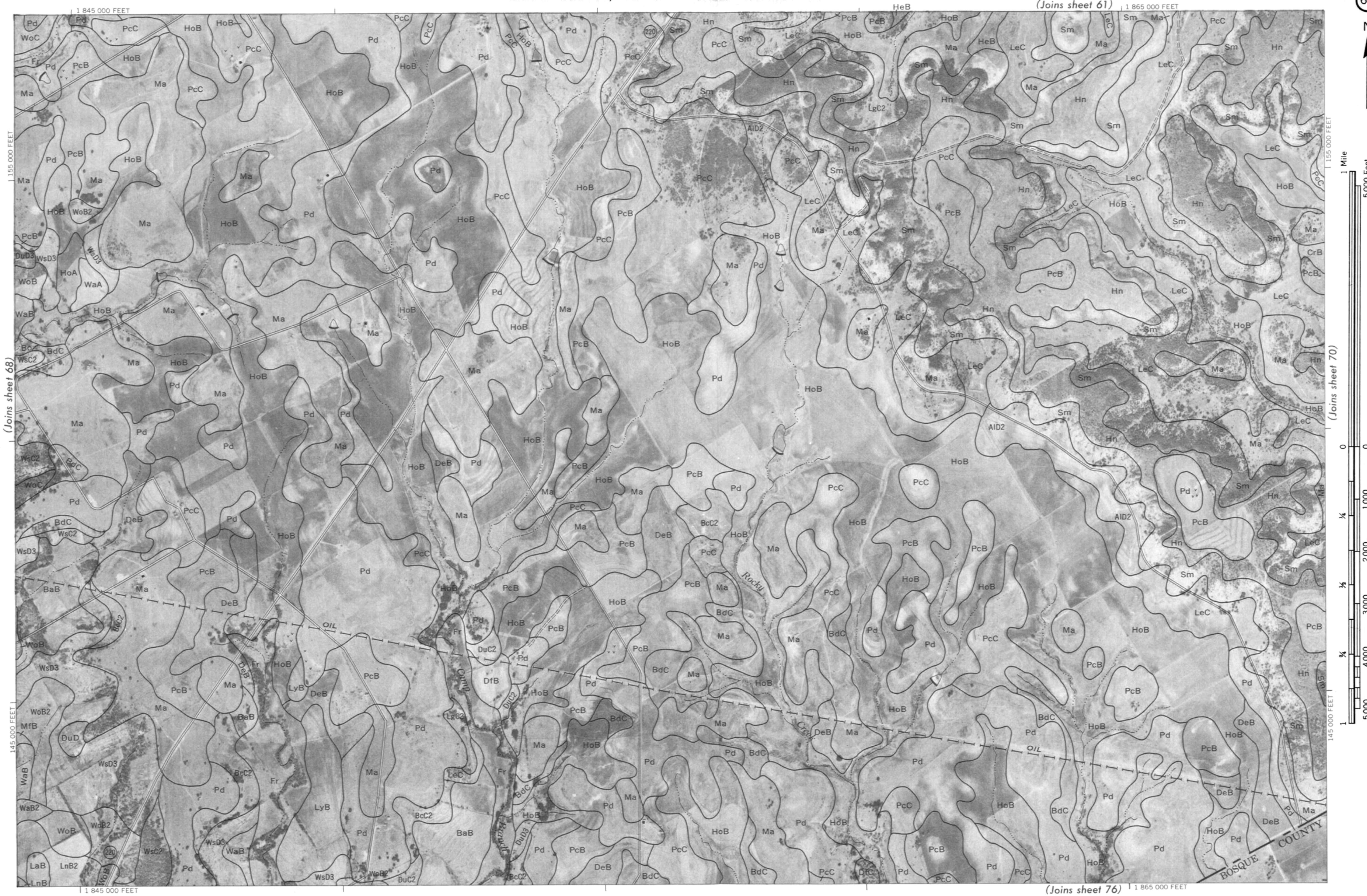


This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 68

ERATH COUNTY, TEXAS NO. 68

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.



ERATH COUNTY, TEXAS NO. 69

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS NO. 7

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 70

N

1 Mile
5000 Feet
0 1000 2000 3000 4000 5000
0 ¼ ½ ¾ 1
Scale 1:20000

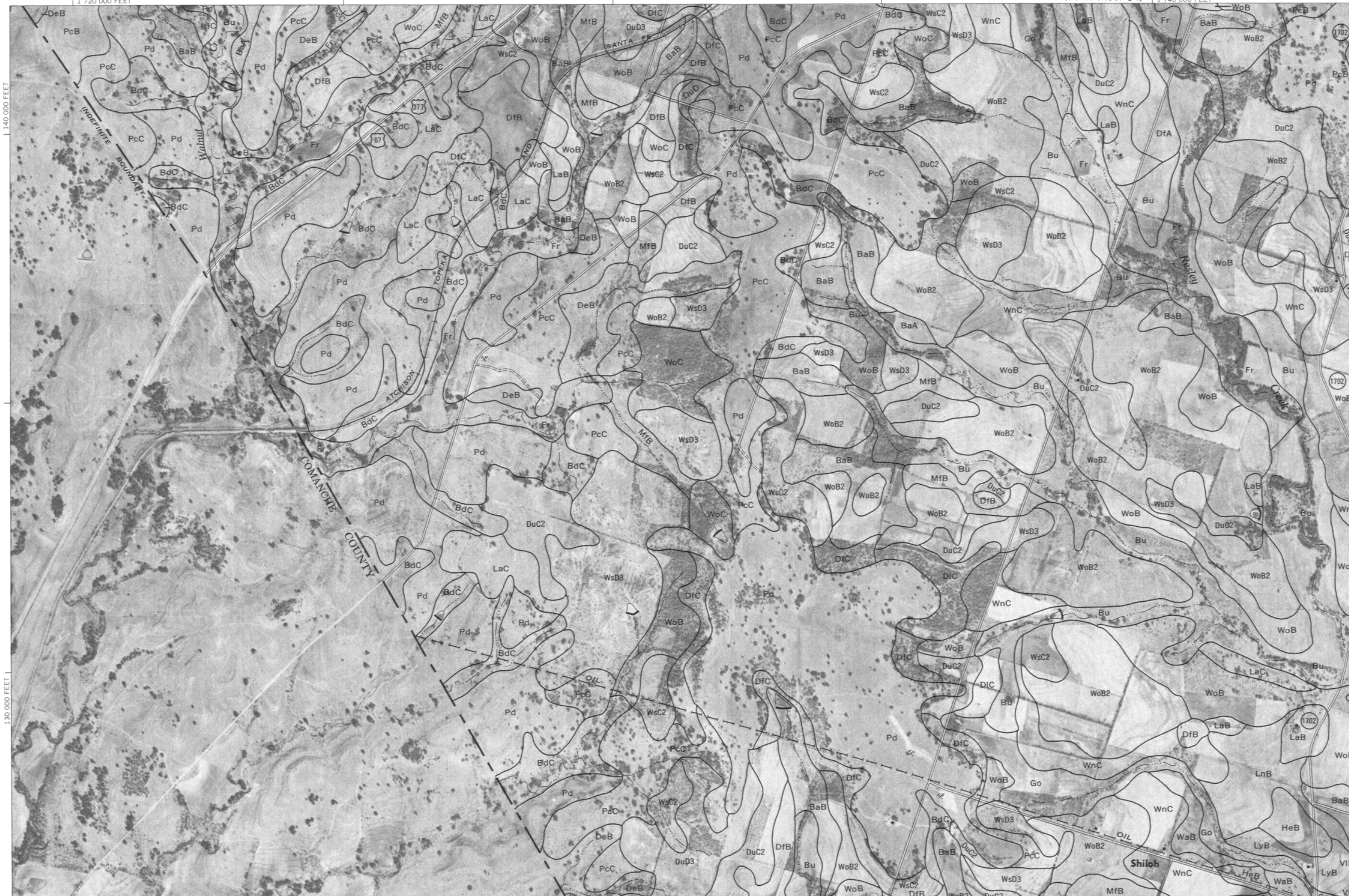
ERATH COUNTY, TEXAS NO. 70

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

71

(Joins sheet 64)



(Joins sheet 77)

1 720 000 FEET

1 740 000 FEET

(Joins sheet 72)

N

1 Mile

5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

ERATH COUNTY, TEXAS NO. 71

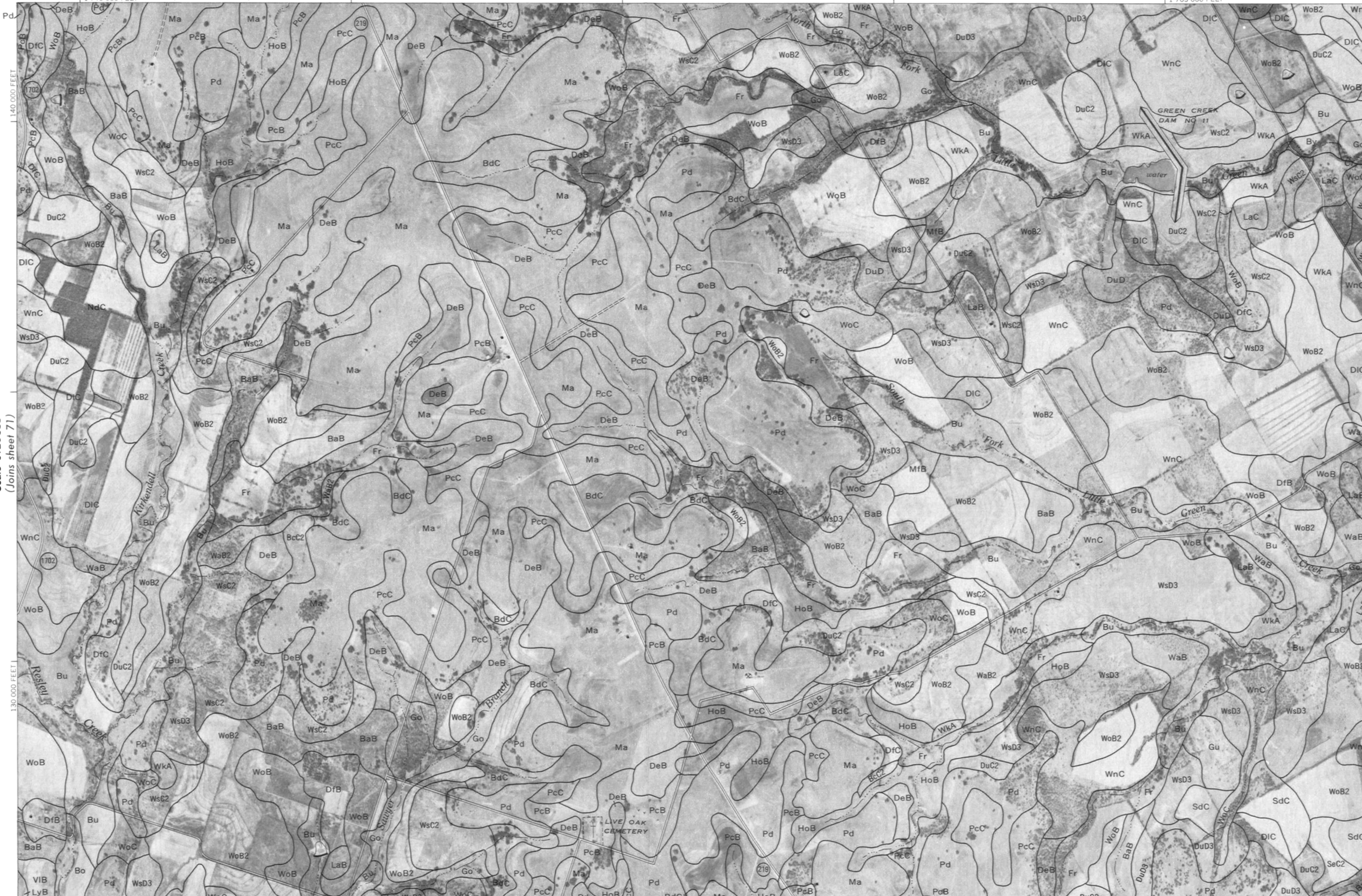
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 72

N

(Joins sheet 65)

(Joins sheet 71)



(Joins sheet 73)

(Joins sheet 78)

1 Mile
5000 Feet
Scale 1:20000
0 1000 2000 3000 4000 5000
0 ¼ ½ ¾ 1

ERATH COUNTY, TEXAS NO. 72

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

73

N

1 770 000 FEET

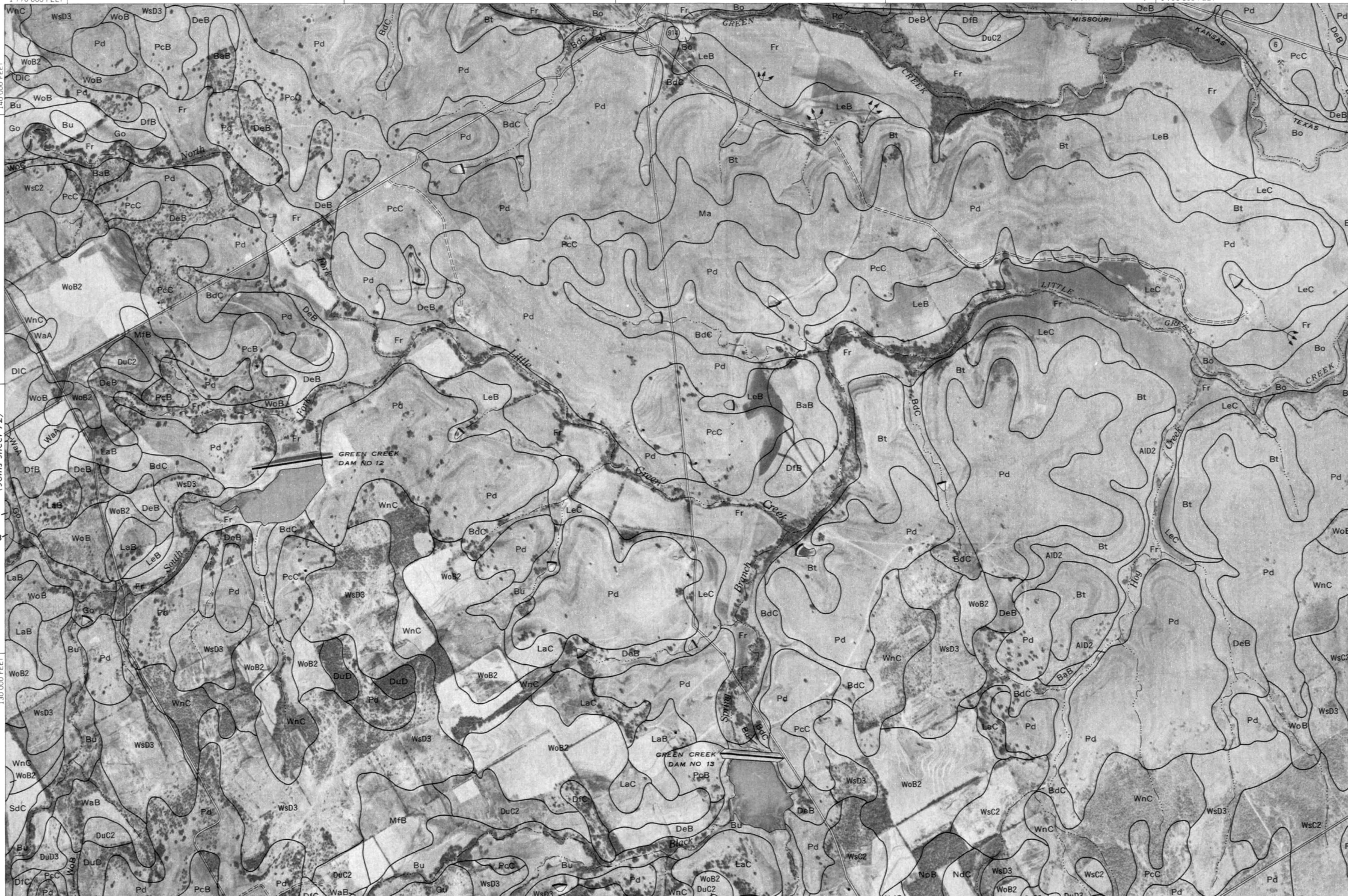
(Joins sheet 66)

1 790 000 FEET

140 000 FEET

ERATH COUNTY, TEXAS NO. 73

(Joins sheet 72)



(Joins sheet 74)

130 000 FEET

1 770 000 FEET

(Joins sheet 79)

1 790 000 FEET

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

1 Mile

¾

½

¼

0

5000 Feet

4000

3000

2000

1000

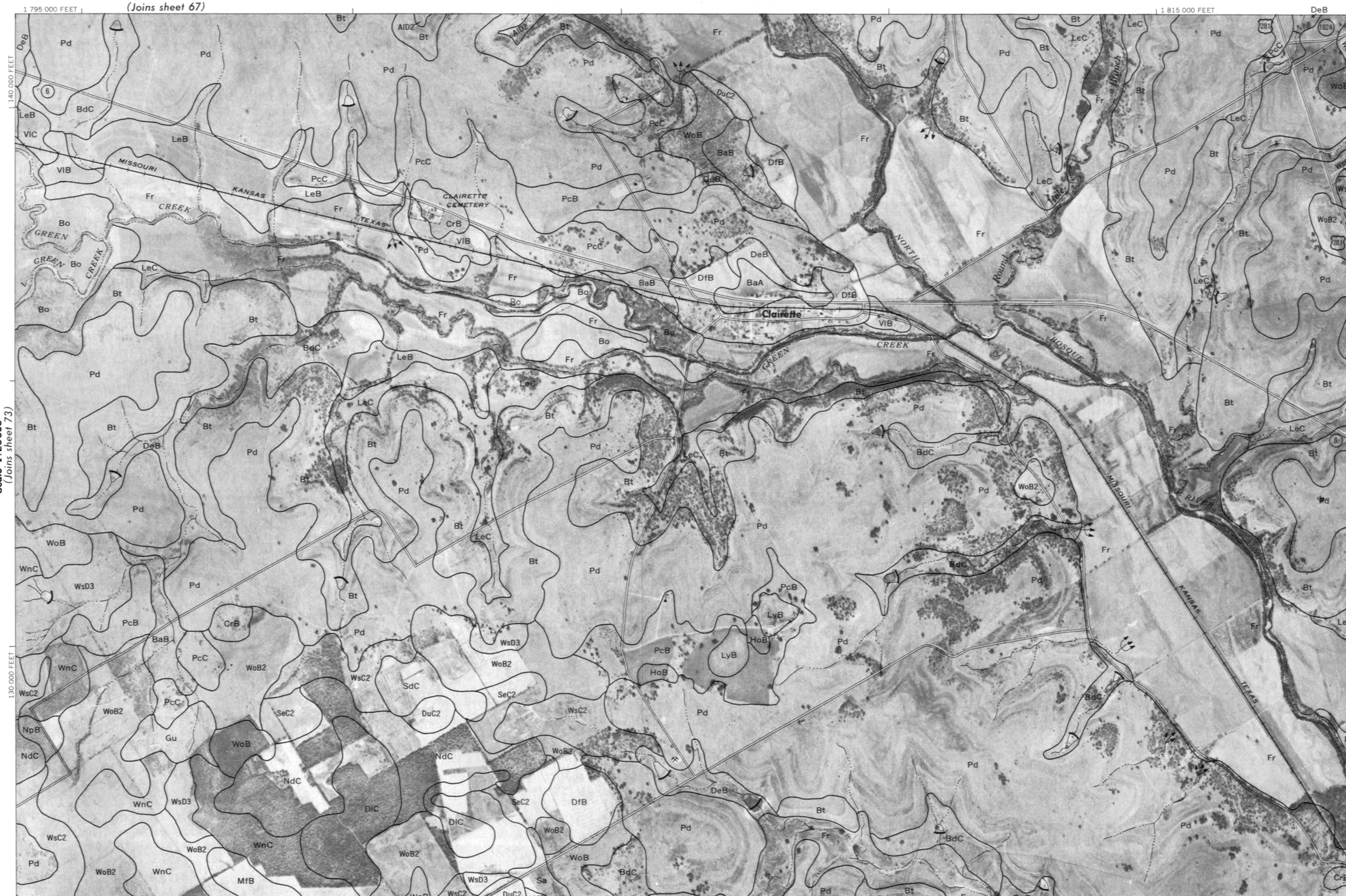
0

Scale 1:20000

(74)

N

(Joins sheet 67)



(Joins sheet 80)

(Joins sheet 73)

(Joins sheet 75)

Scale 1:20000

1 Mile — 5000 Feet

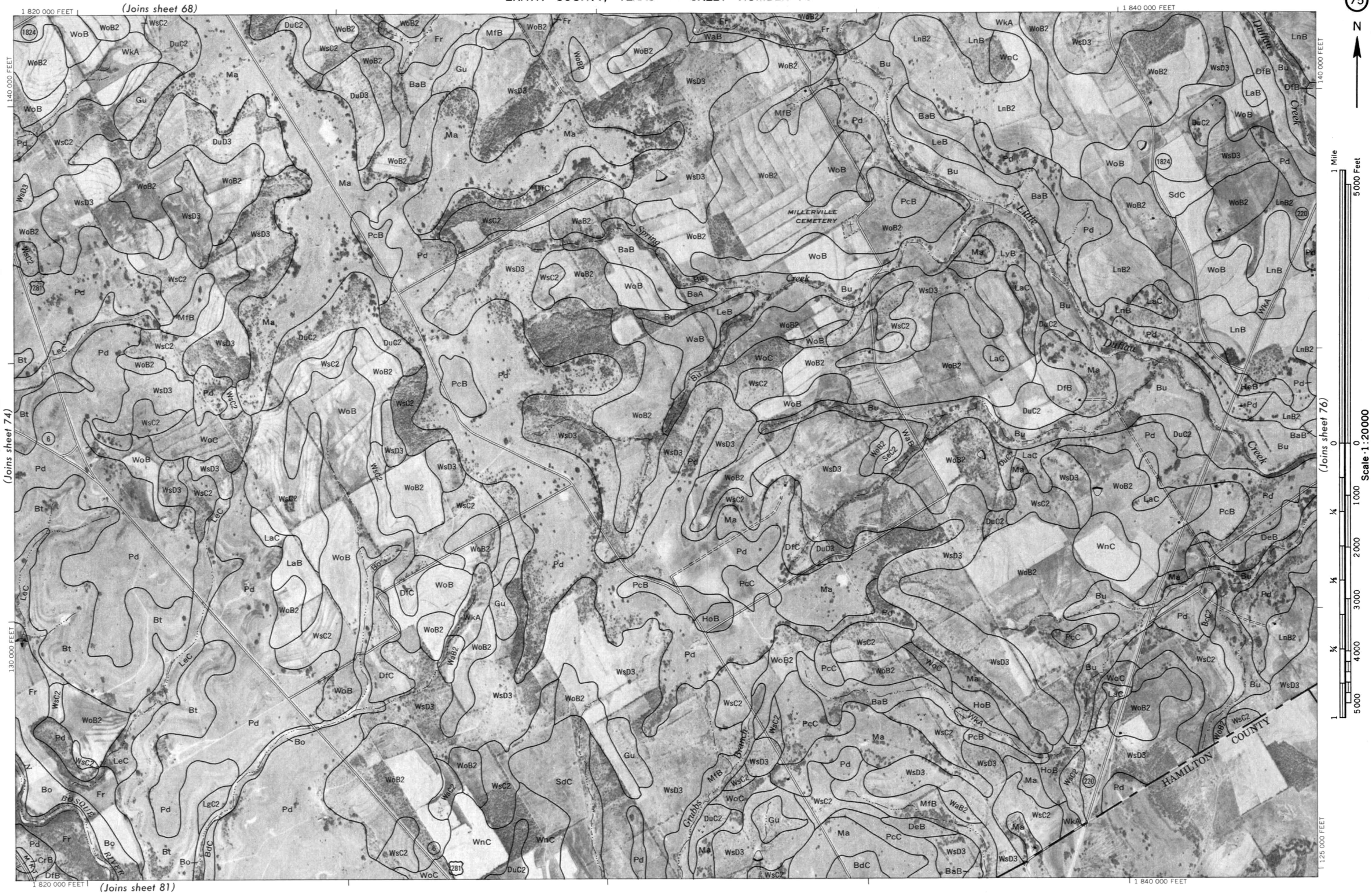
0 — 1000 — 2000 — 3000 — 4000 — 5000

ERATH COUNTY, TEXAS NO. 74

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 75



ERATH COUNTY, TEXAS NO. 75

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 76

N

(Joins sheet 69)

1 845 000 FEET

1 865 000 FEET

140 000 FEET

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

Scale 1:20000

(Joins sheet 75)

125 000 FEET

1 845 000 FEET

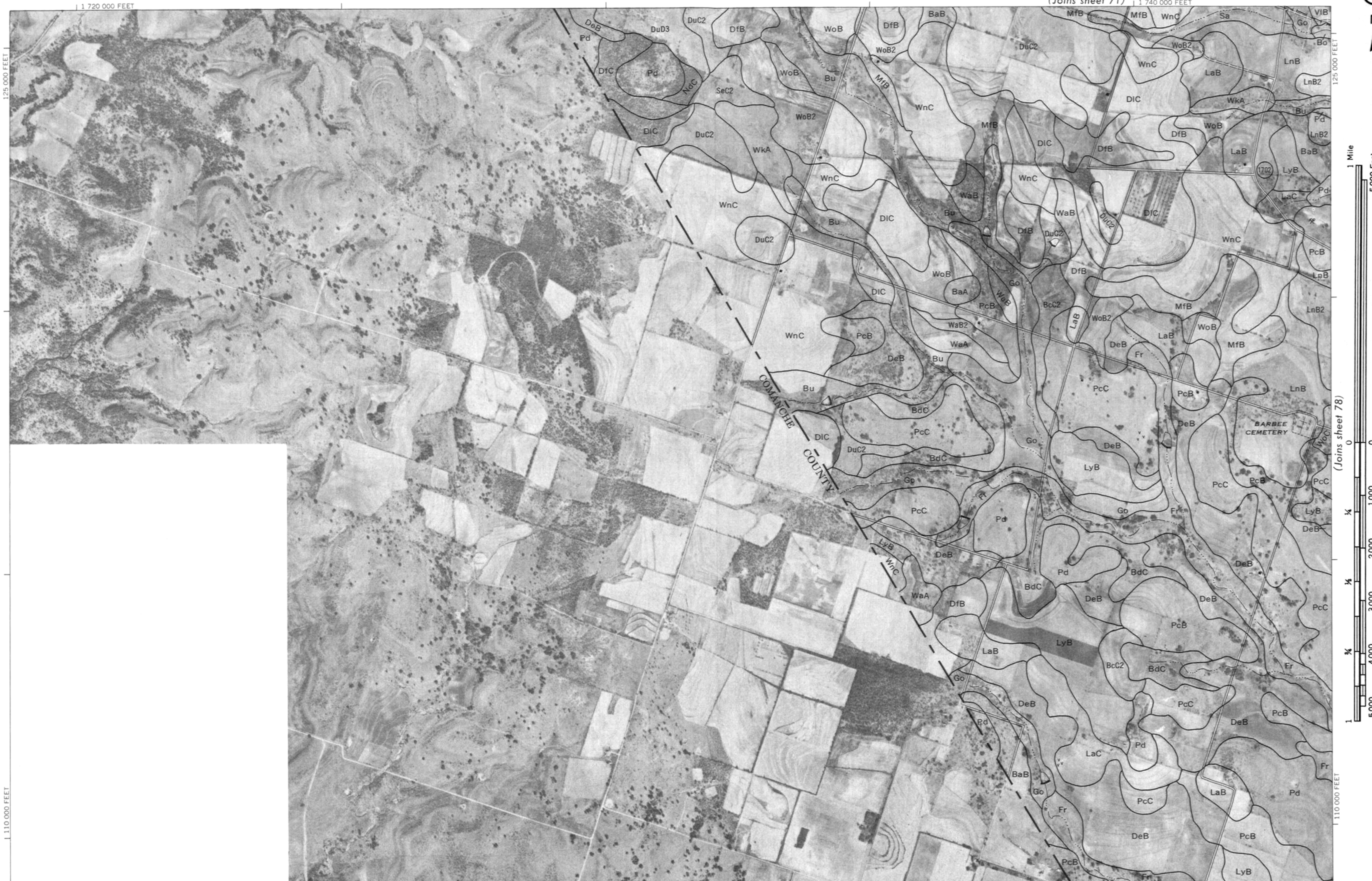
1 865 000 FEET

ERATH COUNTY, TEXAS NO. 76

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

77



This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

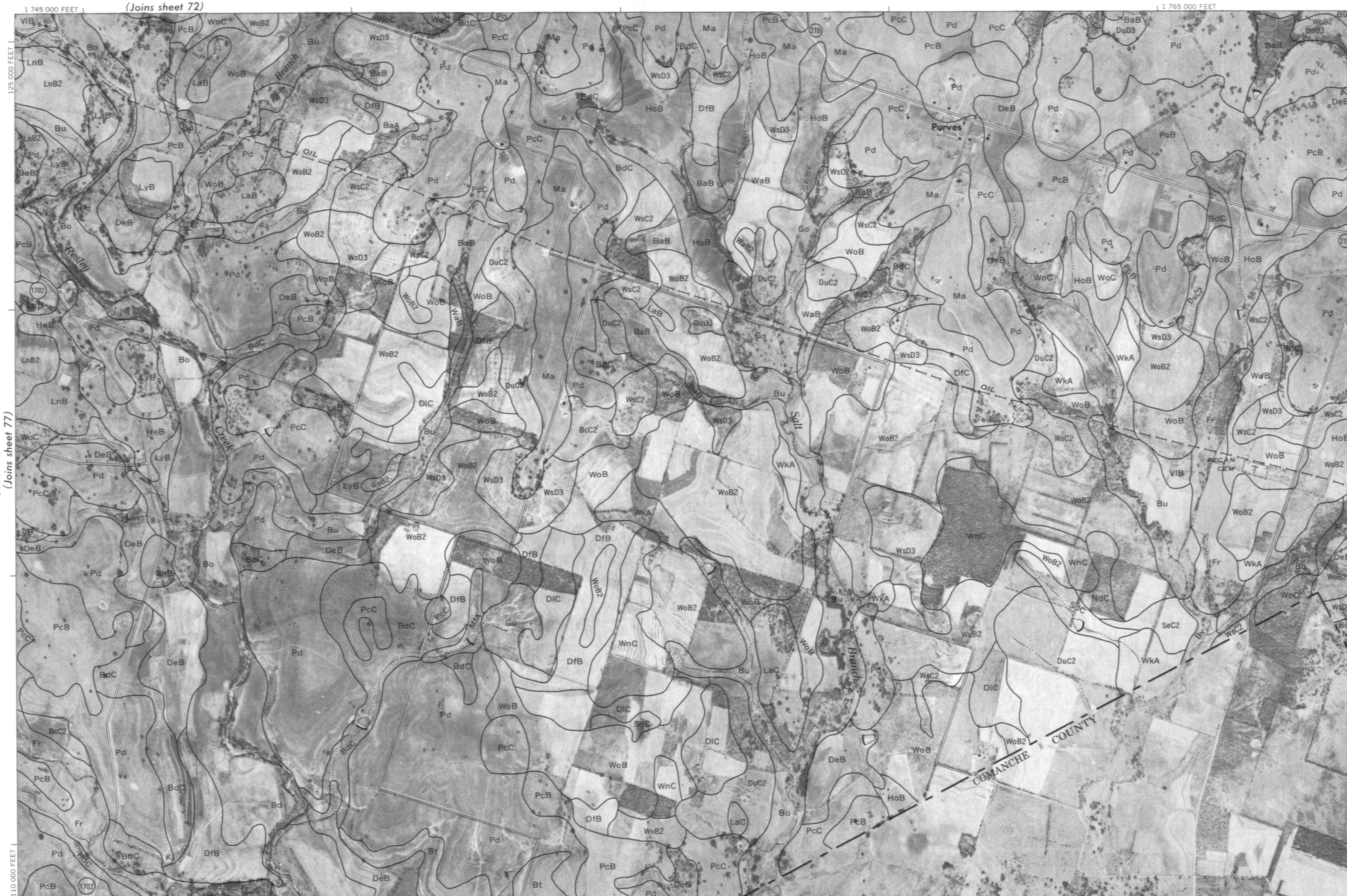
ERATH COUNTY, TEXAS NO. 77

ERATH COUNTY, TEXAS — SHEET NUMBER 78

(Joins sheet 72)

1 745 000 FEET

1 765 000 FEET



N

1 Mile
5000 Feet
Scale 1:20000
0 1000 2000 3000 4000 5000

(Joins sheet 77)

(Joins sheet 79)

125 000 FEET

110 000 FEET

(Joins sheet 82)

ERATH COUNTY, TEXAS NO. 78

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

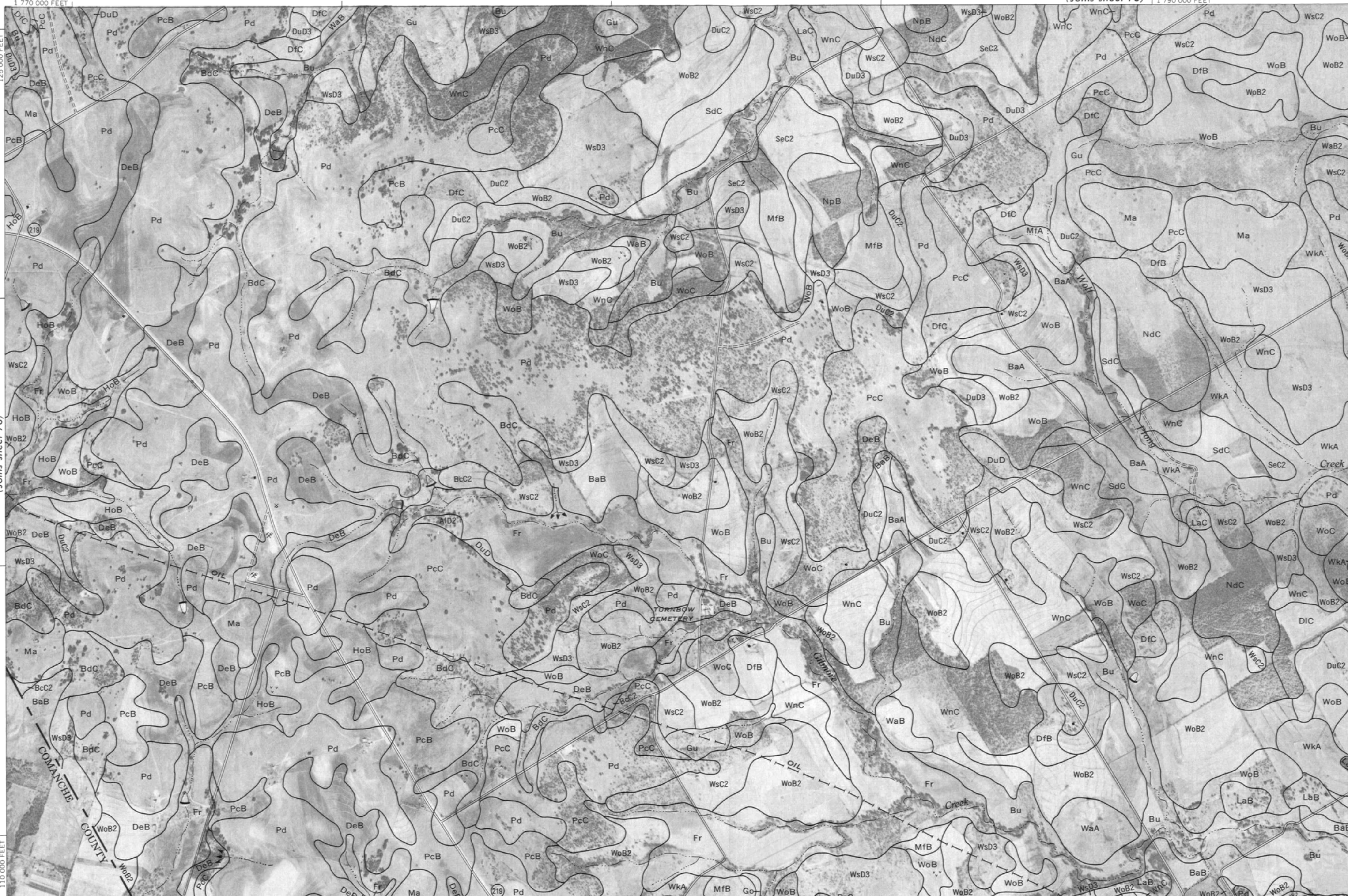
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

79

(Joins sheet 73)

1 770 000 FEET

1 790 000 FEET



ERATH COUNTY, TEXAS NO. 79
(Joins sheet 78)

(Joins sheet 80)

(Joins sheet 83)

125 000 FEET

110 000 FEET

N

Scale 1:20000

1 Mile

5000 Feet

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS — SHEET NUMBER 8

8

N

Scale 1:20000

1 Mile — 5000 Feet

ERATH COUNTY, TEXAS NO. 8

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

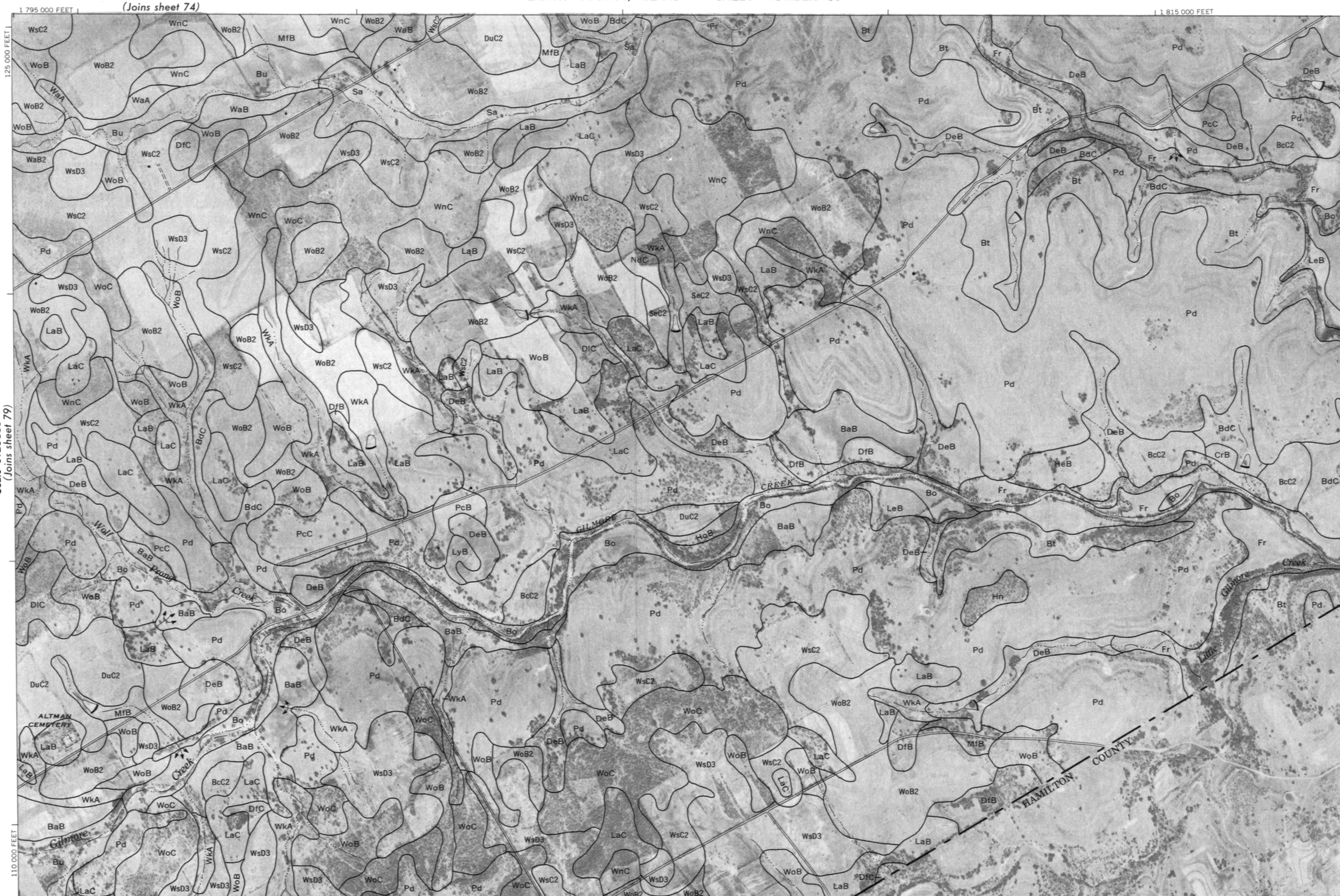
ERATH COUNTY, TEXAS — SHEET NUMBER 80

(Joins sheet 74)

N

1 Mile
5000 Feet
Scale 1:20 000
0 1000 2000 3000 4000 5000
0 ¼ ½ ¾ 1

(Joins sheet 79)



(Joins sheet 81)

(Joins inset, sheet 81)

ERATH COUNTY, TEXAS NO. 80

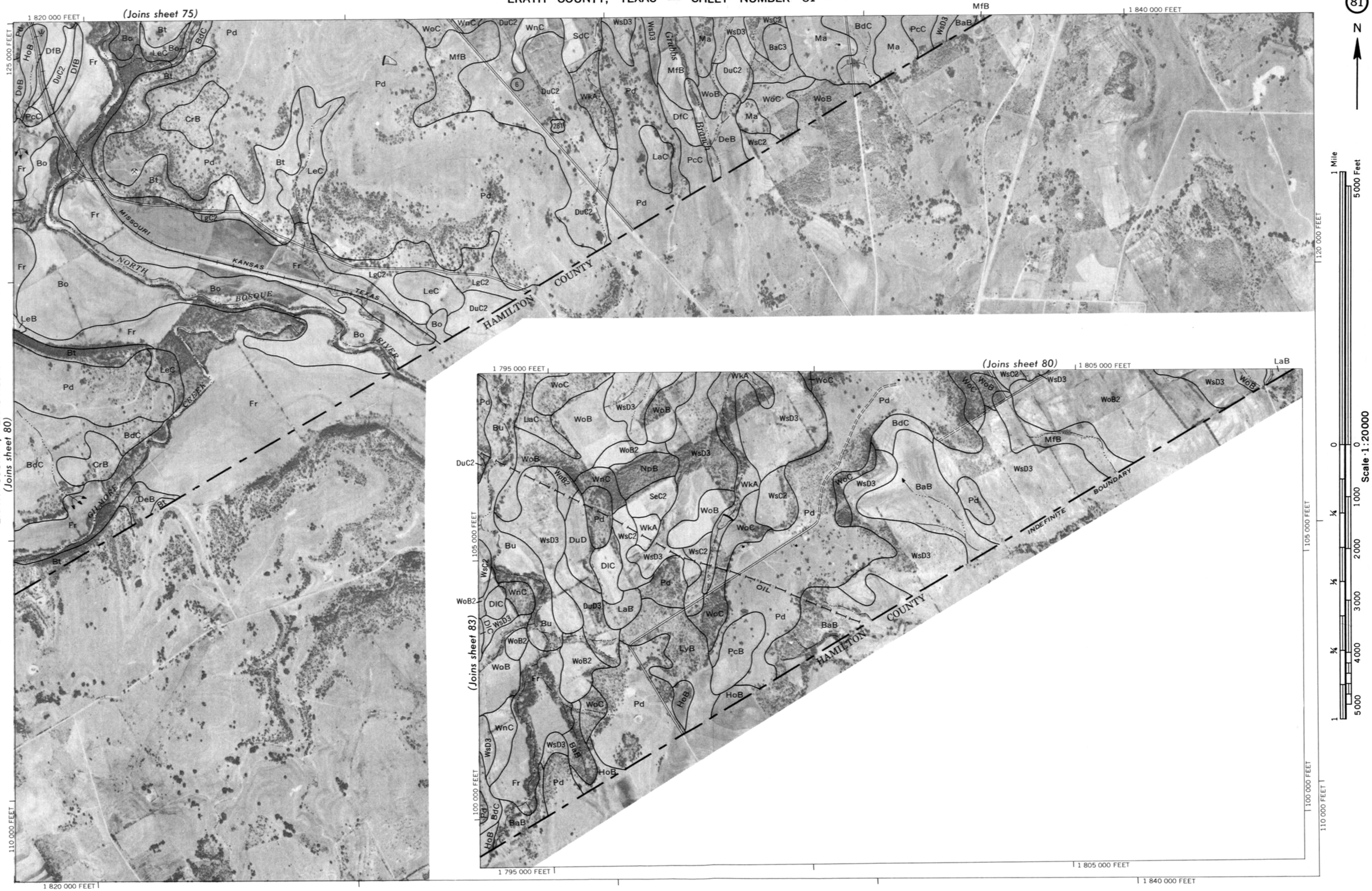
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS — SHEET NUMBER 81

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

ERATH COUNTY, TEXAS NO. 81



ERATH COUNTY, TEXAS — SHEET NUMBER 82

ERATH COUNTY, TEXAS NO. 82

Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.

ERATH COUNTY, TEXAS NO. 83

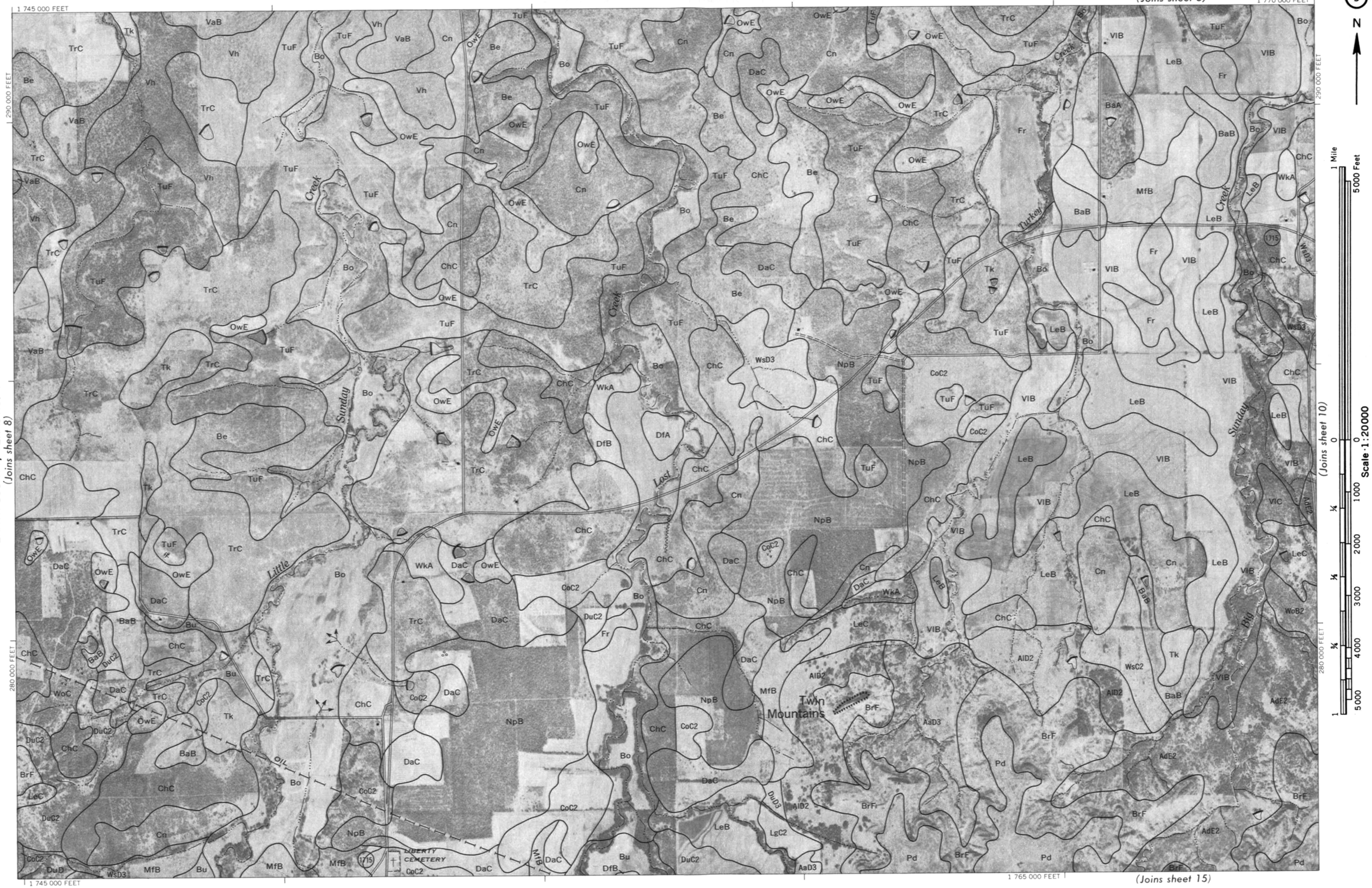
This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.

N

Scale 1:20000

1 Mile
5000 Feet

ERATH COUNTY, TEXAS — SHEET NUMBER 9



This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Texas Agricultural Experiment Station.
Photobase from 1958 aerial photographs. 5,000-foot grid ticks based on Texas plane coordinate system, north central zone. 1927 North American datum.